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NUCLEAR REGULATORY COMMISSION

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570TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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THURSDAY

MARCH 4, 2010

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Dr. Said Abdel-Khalik, Chairman, presiding.

COMMITTEE MEMBERS PRESENT:

SAID ABDEL-KHALIK, Chairman

J. SAM ARMIJO, Vice Chairman

JOHN W. STETKAR, Member-at-Large

GEORGE E. APOSTOLAKIS

SANJOY BANERJEE

DENNIS C. BLEY

MARIO V. BONACA

CHARLES H. BROWN, SR.

COMMITTEE MEMBERS PRESENT: (CONT.)

MICHAEL CORRADINI

DANA A. POWERS

HAROLD B. RAY

MICHAEL T. RYAN

WILLIAM J. SHACK

JOHN D. SIEBER

NRC STAFF PRESENT:

DAVID RAHN

DENNIS DAMON

BOB DENNIG

JEROME BETTLE

J. PEYTON DOUB

BRENT CLAYTON

PATRICE BUBAR

MICHAEL LEE

CHRIS McKENNEY

CHRISTOPHER GROSSMAN

A G E N D A

P R O C E E D I N G S

(8:29:33 a.m.)

CHAIR ABDEL-KHALIK: The meeting will now come to order. This is the first day of the 570th Meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following, Draft Final Interim Staff Guidance ISG-7 on Fuel Cycle, Draft Final Regulatory Guide 1.141, "Containment Isolation Provisions for Fluid Systems," Draft Revision 1 to Reg Guide 4.11, "Terrestrial Environmental Studies for Nuclear Power Stations," Status of Rulemaking for Disposal of Depleted Uranium and Other Unique Waste Streams, Draft ACRS Report on the NRC Safety Research Program, and Preparation of ACRS Reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Christina Antonescu is the Designated Federal Official for the initial portion of the meeting. We have received no written comments or requests for time to make oral statements from members of the public regarding today's session. There will be a phone bridge line at today's meeting. To preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and the Committee discussions.

A transcript of portions of the meeting is being kept, and it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

At this time, we will proceed to the first item on the agenda, which is Draft Final Interim Staff Guidance ISG-7, and Mr. Brown will lead us through this discussion.

MEMBER BROWN: Okay. Thank you. ISG-7 is, as the title says, application to Digital I&C and Fuel Cycle applications. The Digital I&C Subcommittee met back in August, and Mr. David Rahn presented the initiated Rev O of that prior -- I think it went out for public comment afterwards, I thought normally they went out before.

MR. RAHN: They went out simultaneously.

MEMBER BROWN: Okay. So, he will address where they stand now after the public comments, and ACRS made some comments on that Subcommittee. He'll cover those. And with that, I will let you proceed.

MR. RAHN: Okay. Thank you, Mr. Brown, and thank you, Dr. Abdel-Khalik.

My name is David Rahn. I'm the Senior

Electrical and I&C Engineer in the Technical Support Branch of the Special Projects and Technical Support Division of Fuel Cycle Safety and Safeguards. With me today is our Deputy Director, Marissa Bailey. Also, my Branch Chief, Patricia Silva, and our Technical Specialist in the area of this risk index methodology, Dr. Dennis Damon.

In one form or another I've been working in the Instrumentation and Controls area for the nuclear industry for roughly 30 years, but most of that has been in the power reactors business, so for the past two and a half years I've been fortunate to have opportunity to work in the Fuel Cycle Safety and Safeguards Division, which was a real eye-opening experience for me.

Today what I'd like to do is cover a little bit of the background regarding the use of Digital I&C in fuel cycle facilities, and give a little bit of a contrast with power reactors. I'm going to talk a little bit about the regulatory basis that allows us to set up the guidance that we've developed for use for our license reviewers. I'm going to talk a little about the four major topics that we cover in the Interim staff Guidance, and I'm also talking a little bit about the kinds of comments that we received, both from the public, and from the ACRS Subcommittee on Digital I&C. And, finally, I'll wrap it up with a discussion of what's the current status of the Interim Staff Guidance, and what are our next steps in this area.

The purpose of the ISG was primarily to establish once and for all some sort of consistent review and acceptance criteria that could be used by license reviewers mainly related to determining whether or not the licensee has demonstrated adequate description of the availability, and the reliability of instrumentation and control systems used in performing safety functions at fuel cycle facilities.

After much discussion, we settled on the applicability of this particular ISG to the review of applications for new fuel cycle facilities, and also for amendments or renewals to existing facilities for which the Digital I&C systems had not previously been reviewed by the NRC staff.

In general, where we're at is NUREG 1520 is a Standard Review Plan that is used by license reviewers within Fuel Cycle Safety and Safeguards Division to review license applications for fuel cycle facilities. There's a special Standard Review Plan that was written specifically for the MOX Fuel

Facility Project, that's NUREG 1718, but the vast majority of the other fuel facility license applications are following the NUREG 1520 Standard Review Plan.

This particular Standard Review Plan does not contain specific references to design criteria that's applicable to instrumentation and control systems. It also does not indicate the use of any particular industry codes and standards. By contrast, 10 CFR Part 50 does make a specific references to the use of IEEE-603, as an example, so that's right in the 10 CFR Part 50 code, but there's nothing like that. Essentially, 1520 provides criteria that license reviewers could use to determine whether or not there's been an adequate description of the IROFS, which I'll explain what that is, Items Relied On For Safety, as well as the management measures that are used to assure that those IROFS are going to be available and reliable to perform their safety functions.

VICE CHAIR ARMIJO: David, before you -

MR. RAHN: Yes.

VICE CHAIR ARMIJO: Could you just step back one slide.

MR. RAHN: Yes, I will.

VICE CHAIR ARMIJO: I want to make sure I understand the applicability.

MR. RAHN: Yes.

VICE CHAIR ARMIJO: If there is an existing facility, and they apply or ask -- submit an amendment, does that open up all existing Digital I&C systems in that plant for review, or just the new feature?

MR. RAHN: Our plan is to apply it to the new applications.

VICE CHAIR ARMIJO: Okay.

MR. RAHN: The existing facilities, by and large, have already submitted what we call ISAs, or ISA summaries. They're Integrated Safety Analysis Reports, and they've been reviewed already by the staff. S as to preclude confusion, we'd be limiting this particular applicability to the new Digital I&C systems that have been installed.

VICE CHAIR ARMIJO: Okay. Thank you.

MR. RAHN: Also, I was going to mention, Part 70 also doesn't contain specific criteria -

MEMBER BROWN: I want to make sure I clarify that.

MR. RAHN: Yes.

MEMBER BROWN: This is not -- you don't

mean just new facilities.

MR. RAHN: No.

MEMBER BROWN: You mean if you're going to back -

VICE CHAIR ARMIJO: Replace an old -

MEMBER BROWN: Yes, I wasn't sure whether that -

VICE CHAIR ARMIJO: Yes, I was just saying here's existing Digital I&C systems, a new system is going to be installed in another part of an existing plant. It wouldn't open up all this other stuff.

MR. RAHN: Yes.

VICE CHAIR ARMIJO: That's what I was saying.

MEMBER BROWN: There's not an explicit thing. I'm trying to remember, if you look at some of these other ISGS, or like Reg Guides, there's not a statement at the end that says this does not apply to -- it's not going to be backfit for all existing systems. It's kind of an -

MR. RAHN: Yes. I don't think - we've actually turned the sentence around. It's a more positive applicability statement.

MEMBER BROWN: I'm not arguing. I'm not disagreeing with it.

MR. RAHN: Okay.

VICE CHAIR ARMIJO: I just wanted to understand it. I think I do.

MR. RAHN: Okay. Let's move on. This particular ISG was developed through a working group as part of the NRC's Digital I&C Steering Committee's Task Working Groups to address all kinds of criteria associated with applicability of safety-related I&C components. This was -- Task Working Group 7 was formed roughly 11 or 12 months after the initial set of Working Groups were formed.

A little bit of discussion about this fuel facility risk versus reactor risk. In general, the radiological risk of fuel cycle facilities is slightly, or generally less than that of power reactors. Certainly, the source term isn't there that we have for power reactors. However, that being said, we do have potential exposure to radiation by workers, and not just the kinds of things that we find in background, but also because a lot of the fuel cycle facilities produce and use powdered forms of nuclear materials, there's always a risk of inhalation or ingestion, which is not as prevalent in power reactors.

MEMBER POWERS: When you say the risk is

generally lower, that's the result of some quantitative analysis?

MR. RAHN: Yes. I'm going to talk a little bit about that quantitative analysis, as well. We have a methodology by which licensees are requested to follow guidance in NUREG 1520 that talks about how would they assess their risk, as well as the relative risk of different types of events which could occur.

MEMBER POWERS: And this embolds a summation over all the accident sequences?

MR. RAHN: Generally, the accident sequences are treated individually.

MEMBER POWERS: Oh, so you don't assess risk.

MR. RAHN: Well, each accident, or each event has -

MEMBER POWERS: Oh, if I look at things event by event, then sometimes the risks would be very low. Then it's the summation that gets me into real risk.

MR. RAHN: Well, the particular -- it's actually 10 CFR Part 70.61 identifies and sort of puts an anchor on what does the risk entail in terms of exposure, or inhalation, or ingestion.

MEMBER POWERS: So, in fact, what you're comparing is apples and oranges.

MR. RAHN: Essentially, we're comparing the limitations -- pardon?

MEMBER APOSTOLAKIS: I'm sorry. I changed the fruit name.

MR. RAHN: Okay. We're comparing -- what we're doing is we're comparing the risk to certain number of sieverts of exposure, or AEGLs of inhalation.

MEMBER POWERS: In a sequence.

MR. RAHN: I'm sorry?

MEMBER POWERS: In an individual sequence.

MR. RAHN: For a particular type of event, yes.

MEMBER POWERS: But not the summation.

MR. RAHN: I think that's a true statement.

MEMBER APOSTOLAKIS: Yes, it is.

MR. RAHN: That's a true statement.

MEMBER POWERS: So, in general, you can't say what you just said. I have no basis for saying that.

MEMBER BROWN: You can't say what? I missed it.

MEMBER POWERS: You can't say that the risk is generally lower, because there's no summation here. The sequences certainly don't match. I mean, I -

MR. RAHN: I think what we're saying is that if I was to compare the risk to the public, that might be a better way of saying it.

MEMBER POWERS: You don't have that number. If I'm standing at the boundary of your facility, and I ask you what's my risk, you can tell me oh, well, your risk from this sequence is such and such. I don't care about that. I don't know anything about that. I want to know what my risk is, and you don't know. Whereas, a reactor I can presumably get that number.

MR. RAHN: Well, maybe what I could do is put it in terms of how we apply controls to minimize that risk, because that's essentially what we're doing in this particular ISG.

MEMBER BROWN: Can I make one observation relative to the discussion?

MR. RAHN: Yes.

MEMBER BROWN: We had this -- we had a similar set of discussions in the Subcommittee meeting. George brought up a similar issue. The point being was that this discussion on risk, and how you -- whether you combine them or not, that's a function of the ISA, which is developed independent --

MEMBER POWERS: No, it's not. It's a function of language.

MEMBER BROWN: Hold on. Let me finish, please. Independent of the development, and how you build system, a set of I&C for protection issues. They may be more, better or worse, but the risk definition, this is my understanding from the experts that participated in this last time, also, was really a subset that was figured back during the other - and I've forgotten which -- what is it, 1520 that requires the ISA, and defines how that's going to be done. So, there were a number of comments made during the Subcommittee meeting relative to the ISA, and comment resolution, either right or wrong -

(Simultaneous speech.)

MEMBER BROWN: -- right or wrong was that if we want to do something with that, we need to deal with 1520, not this. Now, I'm not arguing -- we can have a nice full discussion on that. I just wanted to put it in that perspective. That's the way it was --

MEMBER POWERS: All I have to do is -

MEMBER BROWN: Did I phrase that properly, George?

MEMBER APOSTOLAKIS: I thought we wrote a letter, Mike Ryan's letter recently.

MEMBER RYAN: On 1520, yes.

MEMBER APOSTOLAKIS: That urges the staff to move more towards PRA.

MEMBER RYAN: Yes.

MEMBER APOSTOLAKIS: But I think a very strong statement from this Committee on that would be helpful, because this discussion has been going on for -- I've been on the Committee for 15 years, Dana has been for 35, so whatever.

(Laughter.)

MEMBER APOSTOLAKIS: Both of us remember from day one that this has been a sore point. Something needs to be done, I think.

VICE CHAIR ARMIJO: Well, I think a fuel cycle facility is fundamentally different from a power plant, both in the quantities of radiological -- hazardous materials, but also it's a batch process. Fuel facilities are batch processes, and the only place where you have significant quantities of both chemical and radiological risk, in my opinion, is the conversion and pelletizing processes, which are really batch processes. They change enrichments, stop the batch, clean out, and you do it again, so it's not the number of sequences that could lead to risk in the PRA type of definition. There are really few, and one or two of those sequences constitutes everything, so I don't think we should overkill a fuel cycle facility with a one-size-fits-all philosophy that's applied -- that's appropriate for reactors -

MEMBER POWERS: Sam, what I disagree with you on is that no, I don't think it's any part of a process that's the high-hazard facility, it's the queue of material waiting to be processed is where the biggest inventories lie.

VICE CHAIR ARMIJO: Sure. I would agree with you there. We do have -

MEMBER POWERS: And the danger you run into here when you use the word "risk," is I can reduce the risk of any given sequence to vanishing. You tell me how low you want the risk, and I can reduce it down there, simply by the way I define the accident sequence. If I say okay, these are accidents that only occur Tuesday morning at 9:00 in months ending in R, I would get that risk down by very artificial means. So, to come in and compare that risk to another risk, which is legitimately calculated, is comparing apples and oranges. Now, whether that has bearing on the discussion here or not, Charlie, I don't know, but if I'm doing this on a risk-informed basis, I have no risk information.

MEMBER APOSTOLAKIS: I think -- maybe it's on the side, peripheral to this, but Sam has a point, too, in the sense that this structure of initiating events and many, many sequences -

VICE CHAIR ARMIJO: Yes, it's much more complex.

MEMBER APOSTOLAKIS: But I think the argument here is the conceptual one. Are you going -- the conceptual is you develop sequences, then you add the consequences to get the frequency of this, or greater. And that is something you can do for anything.

VICE CHAIR ARMIJO: I agree with that.

(Simultaneous speech.)

MEMBER APOSTOLAKIS: -- sequences, then it's very easy to do. It's very trivial to do. There's no question about it, but it's really the cumulative risk that -

(Off the record comment.)

MEMBER APOSTOLAKIS: I'm addressing my colleague here. That makes sense. So, I think you're right, too, but I think it's a conceptual framework that bothers people that it's not really followed.

MEMBER STETKAR: And I think there's a danger. Remember 30 years ago, we knew in power reactors, we knew what the most important sequences were, so we focused a lot of risk analysis effort on those specific types of events, because we knew that. We knew that nothing else was important. Now we know more. We know that a lot more of those other things are relatively more important, and we know that it's more important to take a more comprehensive look at things, because we've learned that.

MEMBER APOSTOLAKIS: It's of interest from the historical point of view, but the very first time somebody talked about sequences and acceptance criteria, that was Reg Farmer of the UK on the Atomic Energy Authority. He also talked about individual sequences, and his argument was, you know, there will be two or three dominating the risks, so we don't have to worry about anything else. He didn't -- he assumed that people would not play games splitting up the sequences like Dana just mentioned. But it's interesting that it took actually quite a while for people to accept the fact that you really have to consider the cumulative risk. Apparently, it's not something that comes easily to people. But if you read Farmer's paper, I think everything he says is correct, assuming that his assumptions make sense. Okay? So, anyway, this has been around for a long time.

CHAIR ABDEL-KHALIK: I think the point has been made, perhaps we should proceed to focus on the main topic.

(Simultaneous speech.)

CHAIR ABDEL-KHALIK: Please proceed.

MR. RAHN: Thank you. The point I was trying to get to was a description of how Digital I&C is applied as a control to minimize -- either prevent, or mitigate the events that we've been talking about. And, in a practical sense, that's the part that we need to know when we talk about what kinds of acceptance criteria are appropriate for Digital I&C equipment. But in fuel cycle facilities, as Dr. Armijo said, it's primarily a batch-type process. And a lot of the local -- a lot of the processes throughout the facility are controlled locally, and they are usually controlled by simple either passive or active engineer-type components. Passive being something like a tank that has a certain geometry, for example, to minimize the potential for criticality occurrence, or they may be a simple mass measurement in a certain batch, so say if I get a certain amount of mass there through the input of powder, there's something that stops the powder flowing when the mass reaches a certain value. So, essentially, a lot of the preventative, and even most of the mitigative-type controls, are designed in a simple fashion. And they don't have complex, like one out of two twice-type logic that you might find in a power reactor facility.

In other areas, for the most part, the processes generally stop when they're put into -- when they're called upon to provide a safety action. And most of the time the applications are such that they will immediately place the facility in safe condition. There are exceptions to that in the fuel cycle facilities, such as in the MOX facility we have things that go on to continue the removal of heat from a vessel. But that's the exception, not more -- not the rule. So, in general, the application of I&C equipment is mostly like collections of active engineered components that collectively reduce the risk of a particular event sequence.

The 10 CFR Part 70 licensing basis requires licensees to conduct this Integrated Safety Analysis that we were discussing. And they are supposed to submit to us a summary of that analysis with their license application. In the analysis, they are required to identify each type of hazard which could occur in the facility, and, essentially, the events that could occur as a result of those hazards, and then also to determine the likelihood, and the consequences of each of those accident event sequences from occurring.

The facility is to compare those -- its performance to 10 CFR Part 61 requirements, which I was alluding to earlier, compares it to a certain limitation on personnel exposure, or inhalation, or chemical exposure to radiological-type processes.

The facility license application is also supposed to identify and describe items relied on for safety, which we call IROFS for short. The nice thing about IROFS is that you can use the terminology as a singular, or as a plural, and we do that a lot. In the sense that as far as it applies to Digital I&C, Digital I&C components would be considered active engineered components that perform safety functions that are a type of IROFS.

And, finally, the license applicant is supposed to describe what we call management measures, which are, essentially, all the different kinds of activities and processes that a licensee would go through to insure that all those items relied on for safety are available and reliable when called upon to perform safety actions.

MEMBER BROWN: Go ahead, George.

MEMBER APOSTOLAKIS: The IROFS, are they similar to the safety-related?

MR. RAHN: I would say there's a corollary.

MEMBER APOSTOLAKIS: You have special treatment for these.

MR. RAHN: You could categorize them as performing safety functions. And I would say -

MEMBER APOSTOLAKIS: But, I mean, there are special treatment requirements that are imposed on safety-related -

MR. RAHN: Yes. The items relied on for safety -

MEMBER APOSTOLAKIS: They are treated separately. They are treated with care.

MR. RAHN: Yes, exactly right. They have certain quality levels associated with those IROFS. Yes, and that's a good point to make.

MEMBER BROWN: Before we go on the management measures -

MR. RAHN: Yes.

MEMBER BROWN: I want to make sure everybody understood, that's a -- correct me if I'm wrong, by the way, that's an all-inclusive term that not -- just doesn't mean how do you maintain it, operate it, stuff like that. It also includes the design, development, setting the standards, qualification, et cetera, et cetera. It's a far more overarching inclusive term than what we typically have used in a power reactor development world, whether it's a design development cycle and process, and then there's a maintenance process of how you deal with it when it's installed, tested, and maintained. So, just keep that in mind.

MR. RAHN: Very well said, Mr. Brown, yes. Very well said. Basically, 70.62(d) says that management measures are to be applied to IROFS in a form that insures that they're designed, implemented, and maintained so as to insure their availability and reliability when needed.

Let me go back one slide here. When talking about management measures, another important point is that management measures are applied in a manner that's commensurate with risk, so the types of controls that are relied upon the most for risk reduction are at the highest quality levels applied to them. And the ones that are required to reduce risk, but with much less magnitude don't have as high a quality applied to them. So, essentially, the application of management measures is a risk-informed process.

MEMBER BROWN: It's also referred to as a graded approach throughout this document.

MR. RAHN: Yes, or graded approach.

MEMBER BROWN: Which we will talk about later, or he will be talking about later.

MR. RAHN: Yes. So, essentially, items relied on for safety are structures, systems, equipment, components, and even the activities of personnel by procedures, for example. They are relied upon to protect, or to prevent potential accidents that could exceed the performance requirements for the plant, or to mitigate the potential consequences of those events. So, IROFS, or what we call sometimes systems of IROFS, they are maybe made out of either what we call active engineered controls, so Digital I&C would be considered an active engineered control, passive engineered controls, that would be something like that tank I was mentioning before, which may have a specific geometry, or the quality level of a piping system that contains nuclear materials. And, also, administrative controls. And they also, for any particular event sequence, there could be a combination of passive and active engineered controls, or administrative controls. In some of the applications we received, licensees have specified as many as three, I think on one of them we had four types of controls that we worked on for any one event sequence.

The topics that we cover are primarily cyber security for the protection of IROFS, independence of controls used for safety functions, digital communications, and the quality processes used for systems development. These topics were chosen by joint discussions between industry and the NRC as those that collectively we felt needed the most clarification for license reviewers.

In the area of cyber security, the interesting thing is that we currently do not have policy or rulemaking similar to what we have for power reactors that talk specifically about cyber security for fuel cycle facilities. There are areas where cyber security is applied for the protection, or security, in general, but in terms of safety-related components, we don't have a piece of code that says thou shalt protect from cyber events safety-related components in the facility, or fuel cycle facilities.

The ISG, though, what we did is we tried to take a pragmatic approach, and we identified cyber events as potential challenges to functions of Digital I&Cs, and they could be either deliberate challenges, or inadvertent challenges. So, what we did in the ISG is identify a set of good practices which may be performed, preferably programmatically throughout the facility to insure that reliability and availability of digital IROFS -

MEMBER APOSTOLAKIS: I am a little bit -

MR. RAHN: Yes, go ahead.

MEMBER APOSTOLAKIS: We had a very detailed presentation here by the people, the staff members who dealt with cyber security for reactors, and, Charlie, I think what -- the fundamental approach they took was to implement what NIST had done, I believe, as I recall, all sorts of standards that the National Institute of Science & Technology has issued. And, as I remember, those were fairly technology-independent, so why don't you do the same thing? I mean, you don't have to work in parallel here and rediscover the wheel.

MR. RAHN: Yes, we are -- well, essentially, the approach we took is to commit to identification of the best way to go about protecting IROFS without specifically pointing to a industry standard. And part of that -- first of all, I don't have a regulatory basis for doing it. That's the main driver for this.

MEMBER APOSTOLAKIS: I understand all this, but my question is really why would the reactor people develop their own approach, and you develop your own approach.

MR. RAHN: Oh, I see.

MEMBER APOSTOLAKIS: When, in fact, the basis upon which the reactor people develop their approach is fairly high-level documents that talk about protecting critical items, this and that. There was nothing specific to reactors there. In fact, that's part of our complaint.

MEMBER STETKAR: In fact, I think, if you recall, I believe they said they had to specialize some of the NIST -

MEMBER APOSTOLAKIS: Absolutely.

MEMBER STETKAR: -- because it was broader.

MEMBER APOSTOLAKIS: Yes. So, I think we need to be a little bit more integrated.

MR. RAHN: Okay. What I could say is

this, in this ISG we identified a place to go to find the ideal security controls which could be applied. And the ones we chose were NIST-853, NIST-882.

MEMBER APOSTOLAKIS: So, you did use some of the same NIST reports.

MR. RAHN: Yes, but they were incorporated by way of a pragmatic application.

MEMBER APOSTOLAKIS: As opposed to the reactor people, you mean?

MR. RAHN: Well, the reactor people, they were required to perform specific development of a cyber security plan.

MEMBER APOSTOLAKIS: Yes.

MR. RAHN: And the plan itself had to be submitted, and in the plan they had to commit to selection of security controls associated with those NIST standards that you're mentioning.

MEMBER APOSTOLAKIS: Right.

MR. RAHN: We don't have a way of directing our licensees to do that type of thing, so, instead, we provide a guidance to say if you're looking to identify what would be a good security control, by way of reference, we identified NIST-853 and 882.

MEMBER APOSTOLAKIS: Let me understand

this.

MR. RAHN: Yes.

MEMBER APOSTOLAKIS: You don't have a way of asking the licensees to do something?

MEMBER CORRADINI: Yes, could you expound on that? That's the one part that I don't -

MR. RAHN: Yes. What we have is - our particular regulatory basis is to make sure that they apply management measures, which are essentially good practices, and also quality programs, that insure availability and reliability of safety-related components. And we don't have a -- what's the best way of saying, there's no regulatory selection of a particular industry code or standard to do that. The licensees are allowed to propose for their facilities the appropriate codes and standards, and then the license reviewer then says does it seem appropriate to me, or not?

MEMBER APOSTOLAKIS: But isn't that almost the same as in the reactor field, where they ask them to submit a cyber security plan, so it's the licensee that does it, and the staff reviews it.

MR. RAHN: Well, I -

MEMBER APOSTOLAKIS: Another complaint of our's was there was not enough guidance for the review.

MR. RAHN: I believe if you look at our regulatory guide for power reactors on that, they were a lot more specific than just say give us a plan. I mean, they had -

MEMBER APOSTOLAKIS: Yes, absolutely. You're right. I agree with you. It's just that you said that you cannot ask your licensees to do something.

MR. RAHN: We cannot tell them that they have to meet a certain industry code or standard.

MEMBER CORRADINI: Whereas, our reactor people can. That's what I'm still struggling with.

MEMBER BROWN: Mike, to answer your -- let me just see if we can move this along. Whether we agree with the approach or not, the section does define what's referred to as an acceptable set of management measures under staff guidance. And there's a listing under that, then there's a description of the management measures that's supposed to be supplied. Then there is, how do you protect digital assets during your life cycle development as you -- that securing communications ports for those. How do you separate what I would call plant communications, and administrative functions from -- so they -- I think he's not given, whether we agree with it or not, he's not given what they put in here. They essentially excerpted the broad approach, and put it into this ISG. Now, we can work with some of the details, but that's effectively the direction, that they didn't reference, what is it RG 5.71, for instance? I don't think it -

MR. RAHN: It is by way of reference.

MEMBER BROWN: There's a reference, but it's not even mentioned.

MR. RAHN: It's not invoked.

MEMBER BROWN: Right.

MEMBER APOSTOLAKIS: You're answering the wrong question, I think.

MEMBER BROWN: Okay. I apologize for that.

MEMBER APOSTOLAKIS: The question, you made the statement -

MEMBER CORRADINI: Which got us both wondering.

MEMBER APOSTOLAKIS: Yes, that you cannot ask the licensees to do something.

MR. RAHN: I could not.

MEMBER APOSTOLAKIS: And we felt uncomfortable with that. I mean, if they are licensees, you should be able to ask them.

MEMBER BROWN: I think they do tell them in this. That's what I was trying to -- I didn't answer properly. I apologize.

MEMBER APOSTOLAKIS: Yes, you went into what they are actually asking them to do.

MEMBER BROWN: Which is?

VICE CHAIR ARMIJO: The issue there is whether it's adequate. And, again, I go back to the compared to a power plant, nuclear power plant where the complexity is mind-boggling, these chemical plants are batch processes isolated, and the management methods in this ISG look pretty good. Now, you can assess if they're good enough, but to say that we do this for reactors, so we ought to do the same thing for fuel cycle facilities, is totally -- it's excessive. I'd like to just make my point.

MEMBER BLEY: Sam, there is a difference between what we ought to do to make it safe, and when we say this is risk-significant, or we're doing a risk-informed approach, those are two different things.

VICE CHAIR ARMIJO: I agree.

MEMBER SIEBER: Yes, but under the risk metrics that they use, they're qualitative rather than quantitative, in my view.

VICE CHAIR ARMIJO: I think it's risk with a small R, because opposed to the TRA formal, capital R risk.

MEMBER SIEBER: Right. ISAs do not produce risk numbers.

(Simultaneous speech.)

MEMBER SIEBER: Things like for application to IROFS, you don't need diversity and defense-in-depth. It has to fail safe.

MR. RAHN: Yes, that's true, but we also advocate the practice of diversity and defense-in-depth.

MEMBER SIEBER: Well, can you make them do it, though?

MR. RAHN: Actually, in this case we can, because there is a COLA requirement for it.

MEMBER SIEBER: Okay.

MR. RAHN: It's in 10 CFR 70.62, and they have -- it's a code by way of footnote. The footnote says defense-in-depth practices should be used.

MEMBER SIEBER: Should.

MR. RAHN: I think it does say should.

MEMBER SIEBER: So, this is not as firm, and cut and dry as one would see. On the other hand, the source term is very low, and the hazard is mainly a chemical hazard, as opposed to a radiological hazard. And because of that, the extent of damage is limited. And I think that's why the standard is lower.

MR. RAHN: That's a good point.

MEMBER RYAN: David, it might be helpful if you would exemplify why MOX was split off, because MOX is -

(Simultaneous speech.)

MEMBER RYAN: -- radiologically, so that's a separate one from this category of low activity, high chemical -

MR. RAHN: That's a very good point. In the MOX fuel facility, because it has Plutonium as a prime ingredient in the production of the fuel, and the accidental ingestion of PUO2 or other types, other forms of Plutonium are very severe, so what was done in the code for them was making sure that safety-related components had a 10 CFR 50(b) like quality program applied to them. And in doing that, the licensee was -- made actual commitment to IEEE-603-type design processes, which then invokes a whole slew of other IEEE processes for digital controls. So, the level of quality applied to the design, because it's a higher risk plant, is higher.

MEMBER SIEBER: Yes, but ISG-7 doesn't apply to mixed -

MR. RAHN: Right. We talk about generalities.

MEMBER SIEBER: So that argument goes away. You apply different standards to that kind of a plant.

MR. RAHN: Yes, I would say that's probably a good statement, because what happened is, the eventual result of this guidance that we've developed in ISG-7 will be enveloped into NUREG 1520, which is going to be used for the general type of review, general types of plants. It was thought important enough for the MOX fuel facility to develop its own Standard Review Plan, so there are additional design and quality requirements in NUREG 1718 for the MOX facility than there are in NUREG 1520.

MEMBER BROWN: Can we -- we exhausted the question. Can we move on?

VICE CHAIR ARMIJO: Yes.

MEMBER BROWN: Okay. David, please.

MR. RAHN: Okay. I will quickly go through cyber, but, essentially, as Mr. Brown alluded to, we've given a lot of acceptable management measures in this guidance that describe performance goals, elements, and characteristics of a program, a programmatic approach to good practices in a fuel cycle facility. And we identify areas, like Mr. Brown mentioned, of critical tasks that whenever you're performing a maintenance, or upgrading software, or something, we have pointed out those are areas where you've got to be especially careful to use good cyber security practices. So, basically, we provided within the guidance a list of what we consider acceptable management measures that could be applied across the board.

VICE CHAIR ARMIJO: Does that start with some sort of a vulnerability assessment to a cyber attack, or event?

MR. RAHN: Yes, one of the most important things is -- after you've identified what are your individual critical assets, you need to perform some sort of, basically, a vulnerability assessment. You almost have to postulate a threat that could occur to that type of asset first, and then identify how it might be vulnerable to that threat, and then proceed to develop security controls that would be applicable to that asset. So, that process is the same for power reactors, as it is for fuel cycle facilities. It's just that it's applied in a more graded manner by -- it's really the same process. You would just categorize fewer items than you would in a power reactor, as being a critical asset.

The section on independence of IROFS was deemed to be a pretty critical one. This section we talk about -- as I mentioned earlier, there is a particular event sequence, or accident sequence which could occur, and then you may apply one, two, or more IROFS to mitigate that, or to prevent that accident sequence. So, it becomes critical then that the IROFS be independent from one another such that we minimize any potential for common cause failure that could occur to both IROFS, and then render all your risk reduction capability to near moot. So, essentially, what we're trying to do is minimize the potential for common cause contributions with the guidance we provided.

Just give a quick example of an event tree, showing on the left-hand side, we may have some type of initiating event that was identified in the ISA. And if there were no IROFS applied, you would go across that top line, and end up with an unmitigated risk. If there was a single IROFS, let's say the one that's labeled IROFS-1 on the diagram, so then you may have the risk reduction factor associated with that one IROFS, but if there are two IROFS, then you would end up with two possible combinations. The probability of failure independently of each IROFS, or there may be some potential common cause which could render both IROFS in an inoperable state. So, what we're trying to do is, we tried to provide guidance that's consistent with other practices in the Division of Fuel Cycle Safety and Safeguards that identifies ways of quantifying, or estimating the magnitude of, and limiting dependent, or common cause failures associated with each of those IROFS.

MEMBER BLEY: My memory from the discussion at the Subcommittee was we don't really do the first half of that, put your effort into the second half.

MR. RAHN: I believe you're correct on that. I think that's a true statement. We put most of our effort into -- and, for the most part, it's done qualitatively, rather than quantitatively. It's not easy to quantitatively estimate the potential common cause failure contribution, but that being said, we did try to put a quantitative magnitude on it. And what we said was that, and I'll get into this in the next slide, I think, but we're trying to limit the potential additional contribution due to the common cause failure to, at most, 1 percent of the total risk. And I think -- I believe, I remember at the ACRS Subcommittee hearing, Dr. Apostolakis mentioned even if it was 10 percent, it's still significantly less than the individual.

MEMBER APOSTOLAKIS: If you say so.

MR. RAHN: So, what we did, we tried to provide acceptance criteria for this. And what we said is that the combined likelihood of all potential common cause failures must be significantly less than the likelihood of the combined failures of each of the IROFS failing independently. And where significantly less means two orders of magnitude smaller than the estimate of independent failures, which translates to, at most, 1 percent.

MEMBER BLEY: Here's where I have trouble, coming back to what Dr. Powers was saying earlier.

MR. RAHN: Yes.

MEMBER BLEY: All the pieces of this, if you don't sum these things up, you don't know what the IROFS add up to. And if you don't really quantify the common cause sources and thoroughly identify them, you don't have a clue if they're less than 1 percent.

MR. RAHN: The way it's generally handled is by estimating the probability of failure of an IROF, and then comparing the probability of failures of IROF-A, and probability of failure of IROF-B to any potential for common cause failure between the two of them. A simple example might be, let's say if you're worried about the -- they happen to both be on the same power supply, not likely, but, I mean, that's just for example. IROFS-A might fail, let's say it's a valve that doesn't operate properly, and IROFS-B might be some kind of a flow sensor that doesn't operate properly. The combination of those independent failures of those IROFS is what's compared to this potential for common cause, so it's more or less a comparison process to see whether or not that common cause contribution is significantly smaller.

CHAIR ABDEL-KHALIK: The assumption, of course, is that the probability of failure of an IROFS is always independent of the event.

MEMBER APOSTOLAKIS: See, that's the other thing, that there may be dependencies between the initiating event and the -

CHAIR ABDEL-KHALIK: And the probability of failure.

MEMBER STETKAR: Unfortunately, I wasn't at the Subcommittee meeting, or if I was, I blanked out completely. The statement you just made, there's -- you use a lot of risk-based statements, and yet your example that you just presented with valves and a power supply is not in the risk community considered to be a common cause failure, that is a functional dependency. It is something that is explicitly modeled. The common cause failure would be a failure mechanism that would disable two valves due to some common problem.

MR. RAHN: Yes, you're right.

MEMBER STETKAR: Regardless of the fact -

MEMBER APOSTOLAKIS: I think they're using the term in the sense of dependent failures.

MEMBER STETKAR: And if that's the case, you're not really evaluating the effects of common cause at all.

MEMBER APOSTOLAKIS: No.

MR. RAHN: I think probably a better way of saying it is it's treated mathematically like that, but, essentially, we are -- where this issue originally came up is in the area of using the same control system for both IROFS.

MEMBER STETKAR: But that's - again, in the vernacular of risk assessment that is -- no, in the vernacular of risk assessment, forget power reactors, that is a functional or physical dependency. It is not what people call a common cause failure, which people have extreme difficulty trying to quantify.

MEMBER APOSTOLAKIS: Maybe we can make it a bit more explicit. If you have two similar components in IROFS-1 and IROFS-2, are you assuming that there may be a cause that is not determined at this point, a cause for dependence, so you have this like a fudge factor there that says well, there is always maybe a 10 percent chance, or 10 percent of the random failure rate that both will fail due to some cause.

MR. RAHN: Yes.

MEMBER APOSTOLAKIS: Do you consider those things, without specifying the cause, or is it always considered functional dependence, or the electric power dependence? That's very different.

MR. RAHN: No, that's a functional dependence. He's right.

MEMBER APOSTOLAKIS: So, you don't consider this class of undefined causes where exactly 10 percent of the failures are -

MR. RAHN: Typically, they'll take a design of an IROFS and they'll go to -

MEMBER APOSTOLAKIS: IROFS-2.

MR. RAHN: Yes, and they'll end up estimating its failure due to all causes, so we're not really considering potential functional dependency there.

MEMBER APOSTOLAKIS: I think we keep coming back to the same issue here. So, a broader question would be, has anybody sat down and identified explicitly similarities and differences in the approach between this approach and the PRA, as we understand it? That would be very helpful.

MR. RAHN: Yes, I agree.

MEMBER APOSTOLAKIS: Because we're using terminology here that has different meanings in different groups.

MEMBER SIEBER: Right.

MEMBER APOSTOLAKIS: And I know that for many years, the people in the fuel cycle facilities have resisted the PRA approach, although a lot of what you are doing is related. I mean, it's logical, and you can't avoid it. But it would be nice to see the detailed differences and similarities. I'm sure there are many similarities, too. But it was beyond today's discussion, but -

VICE CHAIR ARMIJO: David, have any of the fuel cycle -- people that run fuel cycle facilities ever done a bona fide PRA?

MR. RAHN: To my knowledge, they haven't. I can't think of -

VICE CHAIR ARMIJO: And is that because it's too difficult to do, or they can't -- don't have the data? Because, basically, you get your conversion facility, that's it.

MR. RAHN: Yes, I think you sort of touched on it. Every fuel cycle facility is basically unique. I mean, we're getting -

VICE CHAIR ARMIJO: I understand that.

MR. RAHN: It's at the point where we don't have lots of data for a particular kind of facility, or a particular type of environment for that facility, or a combination of processes within a facility that would tend to provide meaningful input data that we could use in a PRA study. So, it would have to be information gathered from general industry, and then somehow studied to determine whether it's a similar application, or not.

MEMBER BANERJEE: But you do follow in the chemical -- do you follow the same sort of methodologies that the chemical industry follows?

MR. RAHN: Yes.

MEMBER BANERJEE: Well, they generally don't do PRAs.

MR. RAHN: Exactly.

(Simultaneous speech.)

MEMBER BANERJEE: I mean, they are doing risk assessment, but using different techniques.

MR. RAHN: Different methodologies.

MEMBER APOSTOLAKIS: Yes, and it always comes down, Sam, to you talk to chemical guys, they will tell you we are different. Chemical engineering is different.

MEMBER CORRADINI: They're definitely different.

MEMBER APOSTOLAKIS: They are not pumps, or something -

MEMBER BLEY: I'm sorry. We heard this in the Subcommittee, too, that the chemical industry does this, and doesn't do that. The chemical industry is broad, and there are a number of areas within the chemical industry where they absolutely do PRA for process to chemical plants, some of the military chemical facilities do it very thoroughly. There are some companies in the chemical industry that have groups that do it real thoroughly, as well. AIChE has put out guidance on how to do that, so there's a real mix.

MEMBER SIEBER: And there is -

VICE CHAIR ARMIJO: Dennis, I just want to get back to my -

MEMBER BLEY: There's a real mix.

VICE CHAIR ARMIJO: Dennis, I want to get back to my real point. Maybe you can answer -- help me answer it. In the chemical industry, they go from most of the time continuous around-the-clock operation putting out a product.

MEMBER BLEY: Some plants do, and other -

VICE CHAIR ARMIJO: And for those guys, maybe the PRA approach might be more useful or valuable than these batch process operations that most fuel cycle facilities use. In fact, all of them that I know of, so I think it's a fundamental difference in the activities of a fuel cycle facility from an operating nuclear power plant, or something that's turning out a commodity chemical around-the-clock 24 hours a day without change.

MEMBER POWERS: Sam, I think one of the things that maybe you're not recognizing is that by abandoning the summation over sequences they're depriving them of their opportunity to go through and look at what should these items relied on for safety or, indeed, having substantial risk achievement worth or risk reduction worth, and, consequently, narrow regulatory attention.

Right now we're trapped in a situation much like we have gotten ourselves trapped in in the nuclear industry, where we have these risk important items, which subsequently on evaluation prove to have neither great risk achievement worth, or great risk reduction worth, but, nevertheless, are incredibly expensive because of the requirements of Appendix B. And that seems to be a substantial sacrifice to maintain a quasi risk assessment. And, in fact, there's not sum over all the sequences, and does not constitute a real honest assessment of the risk.

MEMBER BANERJEE: For batch processes, there's a procedure of Haz OP, which also goes through all the -- because the operating instructions are very complicated, so this is a very highly developed area, because there are so many batch chemical plants. So, I think that every batch plant, and I've dealt with a lot of them, because the pharma industry uses them a lot, they have very well documented procedures for doing this based on Haz Op. All the operations, as well.

MEMBER APOSTOLAKIS: Well, that's

individual sequences.

MEMBER BANERJEE: Yes, everything.

MEMBER APOSTOLAKIS: They don't sum up at the end.

MEMBER BANERJEE: No.

MEMBER APOSTOLAKIS: That's a big difference.

MEMBER BANERJEE: That's the difference, yes.

MR. DAMON: Could I make a remark? This is -- I'm Dennis Damon. I'm the Senior Level Advisor for Risk Assessment for NMSS, and I've looked at the ISAs, and one of the problems with summarizing what's in an ISA compared to a PRA, they're all different, because these licensees, these documents, the ISAs are not public documents. The various licensees cannot look at the other guy's ISA, because it's got proprietary information in it. So, there's no effort made by the industry to be uniform, or to do things in a standardized way.

For example, one licensee does fault trees, and they quantify them. Another one presents the results in the form of event trees, and they quantify them, but feeding into those often are Haz Ops that have been done, or other structured ways of marching through the processes.

And with respect to the issue -- I mean, exactly what Dr. Powers is saying, is you can't use these ISAs to risk-inform things, because they don't add up, the sequences. So, when we on the staff wanted to use the ISA from a plant to risk-inform our Operational Readiness Review, the staff, the NRC staff had to do the adding up part themselves. And that's how we were able to risk-inform which things we wanted to look at in the Readiness Review. But the licensees don't do it, and the reason is because the rule was not -- the motivation behind the rule never was to provide a tool for doing importance weighting or risk-informing of these facilities. It was primarily to identify what the IROFS were, because we -- NRC didn't have a list of these things in our possession, and that's why we had the rule, was to make the licensees list what the IROFS are, and send us that list.

MEMBER BROWN: We do need to move on.

MR. RAHN: Yes, but just to finish that point. Almost all the discussions that I've had with licensees, basically, Haz Ops and what-ifs type analyses are generally performed independent of what we ask the licensees to do.

Also, in terms of independence, in the

event that it's not easy to quantify common cause contribution, we tried to provide some practical examples that licensees could use when considering the applicability of different types of digital IROFS, or IROFS, in general. IROFS could be combined with an active component, and a passive component, for instance, as one of the options.

The ISG also provides acceptable ways of addressing common cause software due to -- common cause failures due to software failures. That part is similar to what we're doing in power reactors, the use of either diversity, or 100 percent testability requirement.

In the area of digital communications, our goal is to insure that digital equipment communicating amongst each other is -- that communications channel is protected, so that it's available and reliable. And we, basically, based our guidance on the Interim Staff Guidance that we developed for power reactors in that sense.

What we have done is, because we don't have lots of inter-channel communications amongst IROFS, we removed portions of the ISG-04 that were developed for power reactors when we made our selection of guidance. But, essentially, what we tried to do is insure that licensees have described their methods for protection of the digital equipment from communications faults. We have isolation between safety and non-safety systems within a facility. We limit or prevent online changes being made. Matter of fact, there was an event associated with that for a fuel cycle facility in the years past. We also talk about protection of the integrity of communications between field equipment and the control room, with the HMI stations are in the control room.

Our last section has to do with the development of the digital systems that are used. And what we're trying to do is provide some kind of reasonable assurance that when those systems are developed, we have used a process that minimizes the likelihood of occurrence of a common cause software failure from occurring. So, the guidance that we've included in here described a graded approach to development of acceptable ways of developing the process, from a very rigorous approach similar to what's used for power reactors, down to something which is closer to a commercial, but high-risk application. Yes, Mr. Brown.

MEMBER BROWN: I was just taking a deep breath.

MR. RAHN: Okay. That's okay.

MEMBER BROWN: Before you go -

MR. RAHN: Yes.

MEMBER CORRADINI: Now he gave you a chance.

MEMBER BROWN: I was going to go ahead and let him finish the next page, before I leave.

MR. RAHN: The approach that we've selected was to provide, basically, a tiered methodology starting with the most rigorous, 10 CFR 50 Appendix B-type process, and that's a process that's being followed by the MOX fuel facility right now.

The next grade down was this commercial grade dedication process for use of commercial off-the-shelf systems. And that's a process where what we tried to do is determine the overall level of quality to see how it compares to that of the Part 50 process. And there's guidance in there to -- pointers to NUREGs that cover that. And, also, EPRI standards, and EPRI technical reports.

Another layer down might be the use of the International Electrotechnical Commission Standards 615-08 and 615-11, and the American version of that, which is ISA S84. There it talks about use of different safety integrity levels that could be applied dependent on risk needs. And then we also allow a means, which is probably the least quality approach, would be use of third-party certification processes, where the risk is acceptably low.

MEMBER BROWN: Before you read that.

MR. RAHN: Yes.

MEMBER BROWN: I wanted to bring up the point on this graded approach to doing things. If you look at the way they assess independence and event sequence categories, they've got what we call a matrix where you talk about likelihood, severity of consequences, and there's three categories of that, high, intermediate, and low. And there are likelihood of occurrence, which are highly unlikely, unlikely, and not unlikely. Don't ask me to deal with the English, but that's what it is. So, they lay out then a three-by-three matrix, and you can see the diagonal is an acceptable risk, if you see where all of them cross, and then the upper part is unacceptable, lower is -- the standard three-by-three matrix approach.

When this was presented to us at the Subcommittee meeting, they discussed this idea of when you have a low consequence and low likelihood, but you still have an IROF, then you can install or utilize an IROF of lower design rigor. I didn't want to use the word "quality," but that's kind of what it falls into, whether it be software, hardware, design. And as illustrated by the approaches they can take to deciding the stuff, or to selecting the equipment they use for that.

In the revision that they submitted this time, they added an example of what they meant. And I need to make sure I get this right. The example they added said the management measures applied to a sole IROF, in other words, one IROF, that is relied upon to provide a high-level of risk reduction, should utilize a highly rigorous set of design implementation and maintenance measures. Then they go on to say, that kind of makes sense, high consequence, high likelihood. Then they go on to say the IROFS for event sequences that are mitigated or prevented by a redundant set of digital IROFS possessing identical design attributes. In other words, it's for the high-risk, high likelihood event sequence, should also utilize highly rigorous management measures. However, it can be justified in that circumstance with redundancy that the IROFS associated with that event sequence can be mitigated or prevented by use of less rigorous management measures. So, I have a high consequence, high likelihood event, some circumstances use one IROF, and it has to be really bullet-proof. But now if I put in two, I can make each of them less bullet-proof. So, that's an example that was provided in here in terms of -- I was uncomfortable with that when I read that. To me, I don't know how you can have a system that's applied to a high likelihood, high consequence, and just because I put two of them in, now I can make it lower -- less rigor, and less quality.

MEMBER STETKAR: And the key is to otherwise identical.

MEMBER BROWN: Yes, they put it all in the same, same -

MEMBER STETKAR: I just wanted to make sure.

MEMBER BROWN: Identical design attributes, but yet you don't have to measure it, monitor it, design it to the same level of rigor. I could not divine how you all came up with this marvelous example here.

MR. RAHN: I understand your concern, and let me tell you, before I address it, I want to tell you where the idea comes from. What we're trying to do is capture the portion of the code which identifies that sole IROFS, any time you have an event sequence with only one control for it, needs to have the greatest amount of quality associated with it. And knowing that there should also be -- you could justify graded approach for when you have multiple components all collectively serving the function of the risk -- the total amount of risk reduction that you're looking for for that event sequence, trying to put that into words. But I think you have a very valid point that you're raising, that if it's a high risk, either a high consequence, or high likelihood, or both, in any case, if it's a high risk event, you want to have the highest quality, so I think that's a good point that you brought up.

MEMBER BROWN: I'm just uncomfortable with the -- to providing that as an example. It seems to me, we need to make a decision as to how we address that, and it ought to be -

MR. RAHN: Yes, I think we oversimplified our example, but I think it's a good catch.

MEMBER BROWN: Okay. I wanted to make sure you understood that, at least from my perspective. And I think we're going to have to address that particular issue in some way, shape, or form.

MR. RAHN: Yes. That's a good point.

MEMBER BROWN: By the way, I did not have any real -- I mean, going through this, I mean, if you've got a low likelihood, low level of consequence-type thing, I mean, in the power reactor world, I don't think I would want to go in that direction. But, I guess, and I hate COTS, but just really don't like the stuff, but I will go with the flow. It seems reasonable to apply something with a little bit less, that you can buy, for something that has virtually no consequence at all, but this seemed to step a little bit outside that boundary.

MR. RAHN: Yes, very good.

MEMBER BROWN: Any other comments on that aspect? Okay.

MR. RAHN: So, the important thing on systems development is that we address these four major areas, the requirement specification, the actual design process, the process of integrating, installing, and testing the system, and the continued operation and maintenance of that system.

MEMBER BROWN: Why do you only address -- you didn't do this -- from the way I read management measures, it's not just software.

MR. RAHN: Right.

MEMBER BROWN: It's also the hardware.

And you make that statement in the text, yet here you're emphasizing the software.

MR. RAHN: Here we're talking about software, but it really applies to hardware and software.

MEMBER BROWN: All right. Thank you for differentiating that.

MR. RAHN: Yes, it does.

The process of developing this particular ISG was to use the Digital I&C Steering Committee's Task Working Groups, where we had members -- participants from both NEI and the NRC, and our particular Task Working Group, we had representatives of the major fuel manufacturing facilities in order to develop this ISG. We had 18 Category 2 public meetings. I also went out and visited with two of the licensee engineering staffs to understand the processes that they use when they are determining what types of controls they're going to apply, as well as what types of management measures they would insure that digital IROFS would be -

VICE CHAIR ARMIJO: Which sites did you visit?

MR. RAHN: I went to the GE Wilmington site. I also went to the Westinghouse Columbia facility.

VICE CHAIR ARMIJO: Okay.

MR. RAHN: I wanted to go to the Richland Washington facility. I just could not get the time to go there.

MEMBER BROWN: I want to back up. This is just a side comment that I meant to say something about. There is, and I didn't realize this at first, but there is an actual IEEE standard associated with graded approaches, which they do reference in this ISG, also. I haven't looked at it. I guess my only question, I guess NRC is not endorsing that. They're just sticking it in as a reference.

MR. RAHN: As a reference.

MEMBER BROWN: You didn't make it an endorsement. So, there is a document that talks about it.

VICE CHAIR ARMIJO: It hasn't been just -

MEMBER BROWN: It's just not invented on the fly. There is a document that goes through it.

MR. RAHN: As we said earlier, the facilities are so different, it's hard to come up with general specific recommendations to do across the board, so we're really relying on our licensee engineering staffs to provide us the thought needed that would then convince us that they have applied adequate management measures.

After we developed the ISG, there was -- it was issued for public comments, and then we also had a Category 2 public meeting to discuss public comments. And we also had a Subcommittee presentation, as Mr. Brown talked about earlier.

MEMBER BROWN: Did you actually -- I mean, you said disposition of comments. You actually went over how you were dispositioning the comments you received throughout the thing.

MR. RAHN: Yes. What happened is, we received -- we identified 29 specific, I'm sorry, 27 specific comments that were included both in a cover letter, and throughout the document, and then what we did is we itemized each one, and then we sat down. We had a meeting on October 29th, I think, last fall to go through all 27 items.

So, in general, the main concern in the public comments was that we didn't stress enough throughout the document the fact that the management measures that are identified could be applied in a graded manner commensurate with the level of risk needed for that particular IROFS. So, in an attempt to do so, we added paragraphs like the one that Mr.

Brown mentioned. I think we fell short, it looks like, in that one area of high risk, so that's something I think we need to correct.

MEMBER CORRADINI: So, I guess I just want to understand. So, the comment generated the modification?

MR. RAHN: No, we actually had -- we had statements to that effect in there. I believe that the industry felt that -

MEMBER BROWN: Well, that particular example was new.

MR. RAHN: Yes, that particular one that you read is new. You're right.

MEMBER BROWN: What we saw back in August.

MR. RAHN: But prior to that, that comment being added, we had similar statements in there, but they didn't think that we were getting the idea across very well. We probably talked about it mostly in an introductory section, and we didn't really talk about it in the topics earlier that we're covering.

MEMBER CORRADINI: So, just to say it differently, you attempted to clarify, but it sounds like it needs to be further clarified.

MR. RAHN: That's what it sounds like to me, too. Right.

They also provide us with several technical comments in the specific areas of cyber security, independence, communications, and systems development. So, I would say, in general, I think the overall opinion is that it's -- the guidance that we've provided is -- I would say it's adequate for coverage for review of a license application, but I believe industry still finds it difficult to deal with this subject in their particular plants. And, I guess, an example of that would be in the past year or so, we received three new fuel cycle facility applications, the AREVA, Eagle Rock Enrichment Facility, the Global Laser Enrichment, and just recently we received an application from International Isotopes for a Uranium deconversion facility. All three of those facilities, for their -

MEMBER BANERJEE: Uranium deconversion? How does that work?

MR. RAHN: Yes, that's for depleted Uranium. What they want to do is recover DOE's depleted Uranium and -

MEMBER CORRADINI: For other purposes.

MR. RAHN: Yes. They want to sell the Fluorine, UF6.

MEMBER BANERJEE: It's basically a

separation process.

MR. RAHN: Yes, it's a separation process. Right. But what I was going to say is, all three of those facilities, for their safety-related components proposed the use of analog hardwired fail-safe type design. And one licensee actually also made a reference to the fact that they would follow IEEE 279-1971, which it's been withdrawn, but it's certainly applicable to hardwired fail-safe design, so I didn't see a problem with that.

MEMBER SIEBER: 603 -

MR. RAHN: That's true, but 603 covers more gamut.

MEMBER BROWN: But 603 is not devoid of application to hardware. You could build analog systems just fine with 603.

MR. RAHN: You could. But then I think the problem is they would to take more exceptions to aspects of 603 that they don't apply.

MEMBER SIEBER: But the hazard in a conversion plant is strictly chemical.

MR. RAHN: That's correct. That's not a --

MEMBER SIEBER: It's a long-term environmental mess, but the hazard is chemical.

MR. RAHN: Right. I also believe they have a limit on how many cylinders of material they can have on site as part of the application.

MEMBER BANERJEE: But I suppose, I mean, even Uranium mill tailings have a radionuclide hazard. I mean, it's a different -- anything with a radionuclide, we have to comment on, or what?

MEMBER SIEBER: We'll get to that.

MEMBER BANERJEE: All right.

VICE CHAIR ARMIJO: If they're asking for a license.

MEMBER BANERJEE: It's covered by the Atomic Energy Act then.

MEMBER RYAN: One glaring exception is phosphate fertilizer, which is loaded with Uranium.

(Simultaneous speech.)

MEMBER CORRADINI: Anything that's been touched by some sort of manufacturing process.

MR. RAHN: Okay. The Subcommittee also provided us several comments. I think some of them were very good practical comments on how we define cyber event. I think we missed the fact that it should be both deliberate or inadvertent events, so we included that. And the other thing is that we had a comment saying the way we defined our cyber event, that we would have also included a bona fide error, software error, and that wasn't the intent, so we modified that description, as well.

MEMBER POWERS: One is fascinated by the idea of a bona fide software error.

(Laughter.)

MEMBER BROWN: Those words are not in the ISG.

MR. RAHN: It certainly comes out after you memorize a lot of failures, what category does it belong into, I suppose is a better way to say.

In the area of communications, we were cautioned to focus specifically on the kinds of architecture that we would find in fuel cycle facilities. In addition, we added some guidance on what kind of operating history makes sense on which to base conclusions regarding reliability. And I believe we added some statements in there regarding how many hours, I think we compared it to so many operating hours of information, in the tens of thousands, rather than in the thousands. It's got to be tens of thousands, or more of operating hours. And we also described how you would use the results of a third-party certification process when determining acceptability of that particular system.

Where we plan to go with this is that, at this present time we've got public comments incorporated, and the Subcommittee comments incorporated. It sounds like we've got one more thing we need to incorporate at this point, but our next step then is to move this document to the Steering Committee for concurrence, and issue it for use. And then our long-term plan is to take this guidance and roll it into NUREG 1520. Right now, the way we're contemplating doing that is to develop an independent NUREG that covers this guidance, plus a description of what kind of information should be submitted with the license application. And then that will be referenced in appropriate sections of NUREG 1520.

Are there any other questions, or comments at this point?

MEMBER BROWN: Does anybody have anything they want to highlight, or take away, or are we ready to proceed on?

MR. RAHN: I'm done.

MEMBER BROWN: With that in mind, Mr. Chairman, I will turn it back over to you.

CHAIR ABDEL-KHALIK: Well, thank you. Thank you very much for the presentation. At this time, the schedule calls for us to take a break, so we will do that, and we will reconvene at 10:15.

(Whereupon, the proceedings went off the record at 9:52:32 a.m., and went back on the record at 10:14:07 a.m.)

CHAIRMAN ABDEL-KHALIK: We'll go back in session.

The next item on the agenda is draft final Reg Guide 1.141, Containment Isolation Provisions for Fluid Systems, and Mr. Ray will lead us through this.

MEMBER RAY: Thank you.

The Reg Guide we're going to look at today you might well wonder whether it warrants the time that's devoted to it. I ask you to be patient.

(Laughter.)

MEMBER RAY: When we get to about Slide 23, I think it is, we finally, after wading through an enormous amount of set-up material, which I would ask the presenters to go through as rapidly as they can and still accomplish their goals, we will get to the item that was of concern to me, at least and caused me to ask that we have this review to see how the full Committee felt about it.

Specifically, the issue has to do with the use of relief values as contained in isolation valves, and as I say, there will be a lot of discussion leading up to that point in the presentation, but that's what I would ask that we focus the most attention on.

The reasons I think are obvious in that the use of a relief valve as containment isolation valve presents, I think, certain questions. The presentation will, anticipating those questions, attempt to deal with them. So I'd ask you to give them a chance to describe where this comes from and how it's justified, and after that I will be interested to see if others are as concerned about this as I was when I first encountered it.

With that, I don't think there's anything more I need to say. We can move on.

MR. DENNIG: I'm Bob Dennig, Branch Chief of DSS Containment and Ventilation branch. The individual making the presentation is one o four engineers, Jerry Bettle, and we will move quickly through the set-up as you say, to get to the meat of the presentation.

And with that, I'll turn it over to Jerry.

MR. BETTLE: Thank you. Good morning.

PARTICIPANTS: Good morning.

MR. BETTLE: The objectives here, we're going to identify the current regulatory requirements, industry guidance, and additional NRC guidance, basically going through the history of where the reg guide came from.

And then we'll get to a summary of the changes made. Those will be the regulatory positions, what's carried over from the initial issue of the reg guide, and what's been added or changed.

Next slide.

Going back to the beginning, we have the General Design Criteria 54, 55, 56 and 57. They require licensees provide isolation capabilities to piping systems, penetrants, primary containment.

Criterion 54, piping systems penetrating containment, this provides a list of the general requirements for the lines penetrating containment. You have capability of leak detection, isolation, containment, and also testability.

Criterion 55, reactor coolant pressure boundaries penetrating containment, any lines that go through containment and connect with the reactor coolant system. The wording that's pertinent as far as the reg guide is concerned, if you get down, unless it can be demonstrated that the containment isolation provisions are acceptable on some other defined basis. A lot of what's in the industry standard and the reg guide endorses the industry standard, goes into identifying what the other acceptable defined basis or configurations are.

Criterion 55 and 56 list four let's say standards or basic configurations. There are some slides subsequent that show you those line-ups. I won't cover those until we get to the slides.

And if we go to Criterion 57 on Slide 10, it talks about in the first place we get a little bit of variation. You can have a closed system. In this case what was envisioned was a closed system inside containment.

And if we go to Slide 11, here are the configurations that Criterion 55 and 56 describe. On those automatic valves, it can be, which on there is the typical depiction for a pneumatic actuated, but it could be a motor operated or hydraulically or some other automatic powered valve.

Slide 12 shows what would be considered a closed system or closed loop inside containment, where the boundary of the system inside containment is one of the two boundaries required for the containment penetration.

Slide 15.

In 19 --

MEMBER BROWN: You're doing a terrific job, I must say.

(Laughter.)

MEMBER BROWN: Getting to the meat of it quickly.

MR. BETTLE: Not to drag through this, I know the Subcommittee members heard the whole thing before.

In 1973, the American Nuclear Society formed a Working Group, ANS-56.2, prepared an industry standard to cover in one document and fleshed out what was in the general design criteria that we just went through, and in addition, provided the other acceptable basis or configurations.

The American National Standards Institute took that issue as a national standard, put their N271 on it and issued it 1976.

Shortly thereafter, in April of 1978, Reg Guide 1.141, the original issue, was put out. It endorsed the N271-1976 as being generally acceptable with six regulatory positions or exceptions or additions required.

The ANS-56.2 Working Group responsible for the N271 ultimately produced a revision which at that point just retained the ANS-56.2, and that was issued in 1984, and they were disbanded and haven't been resurrected.

MEMBER BROWN: This is a tangled steering that's going here and it leads up to the great question that's coming. I'll build the suspense here.

MR. BETTLE: Okay.

MEMBER POWERS: The suspense is killing me.

MEMBER BROWN: Well, things are disbanding. They're no longer available. You've got to go back and ask people who aren't with us any longer.

MEMBER POWERS: Usually it's good riddance.

MEMBER BROWN: We'll see.

MR. BETTLE: Okay. Slide 15, we had the Three Mile Island accident and all of the post Three Mile Island activities, the TMI Action Plan, pu tin an Item II.E.4.2 for containment isolation dependability, to incorporate into 10 CFR 50.34(f)(2) and Section 6.2.4 of the Containment Isolation System and the Standard Review Plan.

The Standard Review Plan that was looked at for updating this was the March 20007 version of NUREG-0800 for Section 6.2.4.

MEMBER STETKAR: Jerome, I recognize you're a person with a mission, but we have a lot of time here.

MR. BETTLE: Okay.

MEMBER STETKAR: So you went through quickly on the previous slide a clarification for containment isolation dependability. I haven't done all of the reading of everything and I didn't have the opportunity to attend the Subcommittee meeting. Can you briefly summarize what that means?

MR. BETTLE: Well, I have the exact in here somewhere. Two, thirty-four, two, provide containment isolation systems that: insure all nonessential systems are isolated automatically by the containment isolation system. For each nonessential penetration except instrumental lines, have two isolation barriers in series. Do not result in reopening of the containment isolation valves on resetting of the isolation signal. Utilize a containment set point pressure for initiating containment isolation as low as is compatible with normal operation. Include automatic closing on a high radiation signal of all systems that provide a path to the environment. And provide the capability for containment purging and venting. Design to minimize the purging time consistent with ALARA principles.

MEMBER STETKAR: Okay. Thanks.

MEMBER BROWN: So what is --

MEMBER STETKAR: It sounds like the -- I mean, one of the things that came out of TMI was the reset thing. So I heard that. Thanks.

MR. BETTLE: Slide 17.

On both the substance and regulatory positions identified in this Revision 1 are essentially intact from the existing original issue of the reg guide. There have been those additions, which you'll refer to as improvements in the regulatory guidance, the additional regulatory positions, and provides updated NRC guidance on acceptable design, testing, and maintenance requirements.

MEMBER RAY: So far nobody has heard anything about a relief valve, have they?

MEMBER BROWN: No.

MEMBER RAY: Just wait.

MEMBER BROWN: I'm just trying to figure out why they waited so long to change anything.

MEMBER RAY: It's getting closer and closer.

MR. BETTLE: Okay. Slide 18.

Endorse the Revision 1, endorses the

provisions ANSI N271-1967, and has expanded from six to, I think, what do we have? Ten regulatory positions?

N271, just to give you an idea from what you see in the GDC, it includes instrument lines, which it references out to Reg Guide 1.11 as providing the source requirements. Use of remote manual valve outside containment for ESF-ECS line isolation. Use of a single isolation valve outside of containment for lines that are closed system outside containment. Use of two valves outside of containment instead of one inside and one outside. The use of flanges in the place of the sealed closed valves.

Provides criterion definition for closed systems both inside and outside containment, and provides for relief valves in the backflow direction as of discharge into containment and although they must be designed and tested so that the discharge side will withstand the containment design conditions.

MEMBER RAY: That was the first mention of relief valve, but in a very restricted sense compared with where we're going.

MR. BETTLE: Okay. There's a Regulatory Position 1. We'll just jump over to the relief valves. I think that will cover a lot of it.

In the Subcommittee meeting, there wasn't a lot of time or talking regarding the other regulatory positions.

We'll go to slide 20.

Regulatory Position 2 is brought in from or modified from what's in N271 from what's in Standard Review Plan, Section 6.2.4. If you look at the regulatory position, it reiterates with N271, states "relief valves in the backflow direction may be employed as isolation valves provided they satisfy the requirements of this standard," which gets into that the discharge side has to be able to handle it and has tested to demonstrate that it can handle the containment pressure and the accident conditions.

It also expands that the licensee may use relief valves in the forward flow direction as isolation valves provided at the relief valve's set point greater than 1.5 times the containment design pressure.

MEMBER RAY: Okay, and so right there is the issue that I want to make sure -- many other things may be of interest to the full Committee, but the expansion they just now referred to is the one that was of greatest concern to me at the Subcommittee level and that I though this full Committee should be aware of because even though it happened way back in time, and he'll talk about that, it nevertheless was a departure, I thought that I couldn't find the roots of, other than what he's going to say.

MR. BETTLE: Okay. Slide 21.

Review of historical documents shows that the greater than 1.5 times containment design pressure, the first place I could find it in any formal documentation or, for that matter, any informal is the May 1980 edition of NUREG-75/087, which eventually became NUREG-0800, Standard Review Plan.

I talked to somebody who had been involved in this area back in the late '70s, and they indicated by general recollection that about 1978 that the 1.5 times is being used, although he doesn't have any, you know, specific recollection of where it came from, if there was any analytical basis or if there's any specific document that actually identified it. An interesting document, back that far, before May of 1980.

MEMBER RAY: So initially it's in the industry standard as an acceptable check valve I'll call it, that is, the backflow mode, and then it's expanded to say, no, you can also do it in the forward flow direct, use the relief valve, provided that it has a set point one and a half times containment pressure.

Now you're using the check valve --

MEMBER BROWN: Containment design pressure.

MEMBER RAY: What did I say?

MEMBER BROWN: You said containment pressure. You mean design.

MEMBER RAY: Containment design pressure is what I meant.

And so I'm sorry for the interruptions. I'm just trying to focus.

MEMBER STETKAR: So the real change here, for me to understand this, is the forward flow from the containment outward before blockage.

MEMBER BLEY: -- on the containment.

MEMBER RAY: Yeah. I mean, you could argue --

MEMBER STETKAR: Everything else I've heard so far is ancient history.

MR. DENNIG: That was in 1980.

MEMBER RAY: This is ancient history, too. It's just we're now putting it in a reg guide. It was buried in the Standard Review Plan before, and I'm just saying that you can argue about whether a relief valve is a good valve or not. I could do that, but it sure as heck isn't --

MEMBER STETKAR: You could argue whether a check valve is a good check valve, too, for that matter.

MEMBER RAY: It sure as heck isn't in the forward flow direction. That's a whole different ball game in my opinion.

MEMBER CORRADINI: Can I just ask then? I see why Harold wanted to get us to this point. So throughout the industry and throughout the plants there are --

PARTICIPANTS: Yes.

MEMBER CORRADINI: -- actual --

MEMBER BLEY: Actual forward flow directions that are taking credit as isolation valves.

PARTICIPANT: Do you want to go to the next slide?

MR. BETTLE: We do have some slides up ahead.

MEMBER BROWN: We didn't know for sure.

Was there any basis for the -- I'm just trying to figure out what's the technical basis for one and a half. Was it out of the ANSI standard or something?

MR. BETTLE: Nobody could recall what.

MEMBER BROWN: I mean, the idea is that it's so far away that you don't have that little sneaking up on where it might start opening a little bit and, therefore, if it's so far away it's going to stay really hard closed?

MEMBER STETKAR: But before we get to the examples, in the Subcommittee did you discuss the fact that realistic best estimate analyses typically show that the containment under accident conditions can withstand things that are two or more times the design pressure so that under a real accident something that has a relief capacity of one and a half times the design pressure will open?

MEMBER BROWN: Yeah, exactly. That point --

MEMBER STETKAR: Not it might open. It will open.

CHAIRMAN ABDEL-KHALIK: Before the containment fails.

MEMBER STETKAR: Before the containment fails.

MEMBER RAY: It will open there or some place below, but, yes, the difference between the containment design pressure and an actuation pressure for a relief valve was touched on not in those exact words, like, "Well, we've show the margin of the containment is two times design," or something of that kind, but the fact is you're talking about design for a pressure vessel versus a lift point for a relief valve. Those are two different things altogether, and so that was part of the discussion.

Again, we were sort of taken aback and didn't have what I think we're going to hear a little bit about here now, which is, well, where have people done this, for goodness sakes, and why.

MEMBER SIEBER: My memory, if it serves me properly, generally the design pressure has a margin of an additional 100 percent to actual rupture. So that's two times the design pressure is where it will actually fail. So one and a half protects the containment and gives you a margin of 50 percent above the design pressure. The design pressure is supposed to be above whatever the actual pressure you expected it to be.

MEMBER BLEY: Well, in a design basis accident, and what John was talking about are things --

MEMBER BROWN: Can I suggest we let the guys now finish? I've interrupted them a lot, but let them tell us the whole story and then --

CHAIRMAN ABDEL-KHALIK: But let me just understand the problem. Is the concern the use of relief valves in the forward flow direction, period, or is the concern the 1.5 containment design pressure set point?

MEMBER BROWN: We each have our own take on it. I'm concerned about putting a relief valve on containment because I don't know how in the hell you surveil it. I don't know what drift there is in it. I don't know a lot of things about a relief valve, but just the mere fact that you've put a relief valve on the containment, in essence, provides a bypass opportunity that then you need to be worried about in terms of position indication and how sure are you what the relief valve set point really is going to be and is it going to leak before it lifts and on and on and on.

But, again, I'm not giving them a -- we've got time. So we can do this any way members want, but I think they should have a chance to tell us the rest of their story.

MEMBER SIEBER: Before they start, let me ask. Going through my memory, I can't remember any containments other than that have engineered vents that have a configuration like this, like this is described in the U.S. where you had a relief valve like on a --

MR. BETTLE: Do you mean a direct relief off of containment for pressure?

MEMBER RAY: I used the shorthand term, which is a relief valve on containment, but of course, it isn't a relief valve mounted on containment. It's mounted on lines that are being protected against over pressure, like they said due to an accident.

MEMBER SIEBER: Right, like the main steam line?

MEMBER RAY: Well, it could be anything, Jack, anything that goes through containment that's subject to water hammer or over pressure due to an accident condition. Again, I plead for us to listen to what they have to say and then we can opine on what we think they should do.

MR. BETTLE: Okay. On Slide 22 here, I tried to provide a little context, but in looking through a significant number of the USARs, I see that the penetration lines, the lowest system our line design pressure was 125 pounds and not necessarily that plant, but other plants the containment design pressure is 75 pounds or less and sometimes considerably less.

So you can kind of see where the relief valve set point of 1.5 times would kind of fall relative to, you know, protecting the system from over pressurization and also accommodating the containment pressure without opening the valve unnecessarily.

Go on to Slide 24 now.

And even more in the way of context, let's go through a few of these configurations you're going to see with the relief valves. As you notice on Slide 24, we have a number of ECCS systems. They're either suction or discharge line or branch lines. The majority of these are considered closed loop outside containments on the line sections that the relief comes off of, and these are boiling water reactors, and they discharge back into mostly boiling water reactions. They discharge back into the suppression pool below the minimum water level, post accident minimum water level.

So in this case, you can see that the line coming out from containment is the back flow line, not a forward flow direction. So in some of these the actual set point since the suction for the system is coming off the suppression pool or condensate storage tank, is relatively low, and as a matter of fact, there's at least one case where the set point for relief is basically the same as the containment design pressure.

But this being a back flow direction, the containment pressure would tend, you know, to seal the relief valve up rather than push it open.

MEMBER RAY: That's arguable, but okay. Yeah, I understand why one would think that.

MR. BETTLE: Okay. So if you think that no relief valves have set points less than 1.5 times, in these configurations there are some that are.

Okay. When --

MEMBER STETKAR: But here the philosophy is that it's operating as a check valve basically.

MR. BETTLE: Yes, right.

Slide 25 is probably a little bit more what you, you know, would be concerned about and cautioning with. In this case you have a discharge from a normal sump. It comes out in the containment isolation valve. You have a relief valve sitting there protecting the penetration line that's inboard of it and it drops into the auxiliary building sump.

MEMBER STETKAR: Jerome, this is a real example. This is not a hypothetical.

MR. BETTLE: Relatively rare, but a real

example because this is a line that, you know, potentially could have contaminated liquids.

MEMBER BLEY: Just for reference, relatively rare?

MR. BETTLE: I only found one.

MEMBER BLEY: Okay.

MEMBER STETKAR: I've never seen one like this. I wanted to make sure it was real.

MR. BETTLE: -- to testify this is an example that you can find.

MEMBER RAY: I'd be horrified if I stumbled across it.

MEMBER SIEBER: Why would you even need that configuration?

MR. BETTLE: Well, this gets back to Generic Letter 96-06, which dealt with water hammer, you know, and cooling water systems inside containment, and it also talked about over pressurization of the lines. One of the issues there was, I guess, a number of plants went back and reevaluated penetration, the potential for thermal over pressurization, that the containment isolation valves, you know, could be closed; when the fluid was cool enough, that the accident temperature inside would heat it up and you get a thermal expansion and exceed, I guess, the yield of the pipe and the penetration.

MEMBER CORRADINI: But can I just back up just so I understand? I don't understand the function. The function this is supposed to have, forget about the black one that's closed. The function this is supposed to have is the relief valve opens up and at some pressure will discharge the contents of what's in containment sump into a relief sump in outside containment.

MR. BETTLE: Right. Now, there's going to be valves upstream of that line on the inside. I'm just depicting what it has here.

MEMBER CORRADINI: Sure, I understand. I understand, but once it's lined up, it does that. So since you found one example of this, I guess that means that this function has to be performed in a number of places that we're doing it differently.

So is the difference simply the location of the isolation valve closer to the wall, so to speak? Is that the difference? Is that the main difference from this being unusual to being usual?

MR. BETTLE: Well, there's a number of strategies for insuring that your penetrations won't suffer the maladies of the thermal over pressurization. One, you can just put in a humongous wall thickness pipe in there, some super pipe, and then not worry about since the amount of heat-up is not going to yield that pipe.

You can also, let's say, engineer your containment isolation valves. If they're spring closed and flow under disc, if you can still get sufficient seating force out of it, but when a thermal over pressurization that would life the disc up and allow some pressure relief that way.

I've even seen where --

MEMBER CORRADINI: Okay. So the answer to my question is there's a whole bunch of ways not to do it this way.

MR. BETTLE: Exactly.

MEMBER CORRADINI: Thank you.

MEMBER RAY: well, one other way not mentioned would be to put the relief valve inside containment and have it discharge inside containment.

MEMBER SIEBER: That's the obvious to me.

MEMBER STETKAR: But Mike's point stands. There are other ways to get around this.

MEMBER CORRADINI: To do this function and not do it this way.

CHAIRMAN ABDEL-KHALIK: Okay. How does

this meet the Criterion 55?

MEMBER RAY: It's an exception.

MR. BETTLE: Well, no, the provision in 55 and 56 says other defined basis.

MEMBER RAY: Tat's what I mean. It's an exception.

MR. BETTLE: I mean that was developed from a standard in the reg guide. The reg guide endorsed the standard, and the standard allows it.

MEMBER POWERS: The standard says do it any way you want to, and they did.

MEMBER BROWN: This is a standard case of general design criteria allowing you to do it some other way other than what they tell you to do it. The same thing happens with independence for I&C systems. They say if you've got some other way to do it, tell us and we'll look at it.

MR. DENNIG: It basically says that 1.5 is good.

CHAIRMAN ABDEL-KHALIK: No, no, no. In terms of having one isolation valve inside and one outside.

MEMBER POWERS: Or any other way you want to do it.

CHAIRMAN ABDEL-KHALIK: How does this meet this requirement?

MEMBER STETKAR: Well, no, you can have two outside in certain conditions.

CHAIRMAN ABDEL-KHALIK: In series.

MEMBER RAY: But this relief valve would be a consequence of having a valve not shown inside containment, and so instead of putting the relief valve inside containment, I would assume this was backfit and was done for access and arrangement reasons. They just didn't want to go inside and put the relief valve inside. So they put it outside.

Now, I may be cynical in saying that, but that's my guess.

MEMBER SIEBER: We'll fix that.

(Laughter.)

MR. BETTLE: On the inboard side there towards the containment on the sump, you'll find an isolation valve. You'll find a check valve.

MEMBER RAY: Sure. Oh, I see. So that's where it is. It's not shown on --

MR. BETTLE: Yeah, so when that outside isolation valve is closed and you have a closure on the inside, then you have the potential for over pressurization of the line.

MEMBER SIEBER: Right.

MR. BETTLE: And basically I'm just trying to show where the fact that you'll have a relief valve located outside of containment that's going to relieve outside of containment.

MEMBER RAY: Right.

MR. BETTLE: Let's see Slide 26.

This is probably what you would look a little bit more favorably on. It's going to just discharge down to the sump in containment.

MEMBER RAY: Yeah, that's what we prefer.

MEMBER SIEBER: Yes.

MR. BETTLE: Moving on to Slide 27, you see when you have what are essentially closed loops inside containment you'll have relief. Again, this is not directly communicating with the containment atmosphere, unlike those other lines that would be communicating with the water line on the bottom of containment or in reactor coolant. In this case it's going to be a cooling water system pulling cooling water.

And if you go to Slide 28, you can also see the cooling water system with a relief valve, again, on the outside. And, again, I wouldn't know in a particular case why it was decided to have it outside, but in this case it's essentially protecting the loop inside containment as well as the -- since those lines also are in containment.

MEMBER RAY: Yeah, now, this is a little less of a concern, but not of no concern.

MEMBER SIEBER: Well, this is a closed history. You have to have a breach of integrity in that system for you to have the addition accident.

MEMBER RAY: Yeah, but that's why, Jack, the isolation valve exists in the line at all.

MEMBER SIEBER: Right.

MEMBER RAY: And this relief valve essentially bypasses that isolation valve, and that's why I said it's a little less concern, but --

MEMBER BLEY: Are there many of these? Do we know?

MEMBER STETKAR: This is also a real example?

MR. BETTLE: Yeah, it's a real example. They're are probably, I'm sure, more common than the one on like sump lines.

MEMBER SIEBER: Still good.

MEMBER STETKAR: So you've seen more than one of these.

MR. BETTLE: Yeah, yeah. Yes, I should say.

Okay. In looking at this right here, a lot of these relief valves, they're sitting inboard of the outboard isolation valve, like in this case there's only one isolation valve in the penetration line. They are involved with the -- if it's required to have an Appendix J test on that containment isolation valve, that the relief valve is part of that boundary. So when you do the local leak rate test, you will be evaluating the leakage condition of that valve to a pretty fine degree so that you don't get error, you know, at accident pressure.

Most of these lines are on the cooling water system operating at pressure above accident pressure. So the normal system lockdown like in the case of closed loop inside containment. You know, you'd lock down the system and verify that there's no leakage anywhere, and that's basically performing the inner boundary leak test instead of draining it out and pressurizing with air and doing like an Appendix J test.

So you will be on these relief valves testing them periodically. They're also in the ASME in-service testing program as relief valves. So periodically they get removed and set point tested.

MEMBER SIEBER: Section 11.

MR. BETTLE: In which case then they also, you know, verify that they don't have any seat leakage at the end of the testing.

MEMBER SIEBER: Section 11 test?

MR. BETTLE: Yeah, yeah.

MEMBER BLEY: I'm just curious of the history. When you said this was established in 1980, I think, these were in existence before that, but they were approved on a case-by-case basis?

MR. BETTLE: Okay. A number of them are, and then when that Generic Letter 96-6 went out, I think some of the plants went back and, you know, were a little bit more conservative. So a number of different relief valves and pressure relieving mechanisms were engineering into containment penetration piping. So there was kind of like a rush back in the number of additional relief valves that got added as a result of that generic letter.

MEMBER RAY: Let me say at least it hasn't crossed my mind that we're talking about undoing anything. This is really a question of whether to incorporate what we've been looking at here in the last few minutes into the reg guide. That's the issue, I think.

MEMBER CORRADINI: Versus already being

used in the Standard Review Plan.

MEMBER RAY: I'm just saying this is another level of sanction putting it in the reg guide. Not only are we saying we've done it and, you know, like a lot of things historical, now we're saying this is really okay, and it's part of the reg guide, and that's what we're talking about here.

VICE CHAIRMAN ARMIJO: But whether it's in the reg guide or not, it's still okay.

MR. DENNIG: But for 30 years whether you put it in the reg guide or not, the issue is still somebody could do it and you couldn't prevent it.

MEMBER RAY: Well, I don't think so in this sense. We look at reg guides, I think, as defining an acceptable way to do things. It doesn't define every acceptable way. If you've got a need to do something, I'm just saying I'd like to see the threshold for doing this kind of thing we've been looking at here higher than, oh, well, I just thought of the reg guide. That's all I'm saying.

And it's not a matter of going back and undoing things that have been approved before, in my opinion. It's a matter of do we sanction this kind of thing in the reg guide so that now all I need to do is point to the reg guide and I'm --

VICE CHAIRMAN ARMIJO: It's sort of endorsing --

MEMBER RAY: It's an endorsement. That's right.

VICE CHAIRMAN ARMIJO: It's an endorsement of poor practice.

MEMBER RAY: Going forward I don't want to see people doing this.

MEMBER BLEY: You're almost not forced to think about it.

MEMBER RAY: Right. This is the way to do it.

MEMBER STETKAR: For people who understand regulatory guidance much better than I do, is there any fundamental difficulty with saying in the reg guide looking from today forward you shouldn't do this?

MR. DENNIG: That's the kind of thing that's generally rulemaking kinds of things.

MEMBER RAY: Wait a minute. Let's say it another way. We often say in reg guides, don't we, that we're not defining all of the acceptable ways that might be --

MEMBER STETKAR: Well, but I mean in terms of saying you shouldn't do this. There are reg guides

I've read that said, you know, this applies only for new reactor designs, for example. So, therefore, by implication they exclude, you know, existing reactor designs and things that people have been doing.

MEMBER RAY: Your question goes to a further step beyond where I was thinking, which was just I don't want to sanction this in the reg guide as a minimum.

MEMBER SIEBER: I think you have to go beyond the reg guide if you want to forbid things. The staff can tell me whether that's right or wrong, but if you want to forbid something, it has got to be someplace at a higher level than a reg guide..

MEMBER STETKAR: Yeah, but the implication is that if something is sanctioned in a reg guide, it's acceptable. If it's not explicitly sanctioned, you have to define it.

MEMBER RYAN: But the language I remember, the reg guide has described one acceptable or several acceptable methods to address whatever the issue is of the reg guide. It doesn't say it's the only way to do it. It doesn't say you can't do it some other way. It's these are acceptable ways with this requirement.

MR. DENNIG: The purpose of the reg guide provision was to take all of the guidance that's been used by the staff that is not in the reg guide and sweep it into the reg guide, not to change that practice.

MEMBER RYAN: All right. So let's say that's one goal, but the one I'm struggling with is how you're not feeling, you know, good about the fact there are several methods in here that probably aren't very good at all. That's a more important question.

MEMBER RAY: I'll respond to both of you by saying sweep everything in? Well, maybe not everything. Is it really necessary that we say everything that's been approved in the past should now be in the reg guide?

I don't think there's anything that compels us to do that.

MR. DENNIG: I think the logic would be that this has been approved fairly widely and, therefore, it belongs as part of the guidance.

MEMBER RYAN: But I'm hearing pushback on the fact that there are some of these methods from Harold's point of view -- I'm no expert in this area -- that he doesn't want to see go forward. That's very important. That's the most important question you heard in this.

MEMBER RAY: At least not without them

going forward as an exception to the reg guide.

MEMBER RYAN: That's right.

MEMBER RAY: I don't have a problem with the staff approving exceptions to regulatory guidance within reason.

MEMBER RYAN: So why don't you say this way of doing it used to be okay? We don't want it to be used anymore, but you don't have to go back and change it.

MEMBER RAY: Well, that, but I'm also saying the regulatory guide should not sanction and endorse an application in which you've got a relief valve essentially providing a bypass to the containment, and the only protection you have is this 1.5 set point.

MEMBER STETKAR: Unless the staff makes a specific determination for --

MEMBER RAY: It doesn't prohibit them from doing that. That's right.

MEMBER STETKAR: -- a particular licensee --

MEMBER BLEY: I think that's it. You ought to think hard about it if you're going to do this.

MEMBER RAY: Right.

MEMBER CORRADINI: Just a question here. So, I mean, the way you phrased it would be, I guess I would ask the question like this. Is this enough of considered insuring good practice to stick it in the reg guide? If it's good practice, it ought to be in the reg guide. If it's not good practice, it has got to come back in --

MEMBER SHACK: Acceptable practice.

MEMBER CORRADINI: Well, acceptable practice

MEMBER RAY: But you don't have to list every acceptable practice.

MEMBER CORRADINI: No, but my only point was I think what I thought I heard Harold's principle is unless a case-by-case argument is made and accepted by the staff, this is not considered in your view acceptable practice

MEMBER RAY: Because there are alternatives. They may be more expensive. They may be more difficult.

VICE CHAIRMAN ARMIJO: The answer is yes.

MEMBER RAY: But there are alternatives that don't create a containment bypass to protect the piping against over pressure. Put the damn relief valve inside containment.

MEMBER RYAN: Well, that's what the reg guide should say then.

MEMBER SIEBER: Well, no.

MEMBER RYAN: No?

MEMBER RAY: It allows it, but to say you must put it inside containment is going further than I would.

MEMBER BROWN: But you can use the word "should." I mean a lot of the reg guides still say you should. You know, these are acceptable. The word "should is thrown around quite frequently in these guides.

MEMBER SIEBER: "Should" is not a good word.

MEMBER RYAN: I guess I'm thinking some of the subtleties are escaping me because it sounds like there's a very clear thing that you want to accomplish in this revision, Harold, or you want the staff to accomplish. Yet we're dancing around words that aren't going to be crystal clear on that.

MEMBER RAY: No, I just don't want to include something that I think should only be done with specific staff review as an exception.

MEMBER RYAN: I would kind of like the criteria that you articulated to say that, you know, no matter how you do it, you shouldn't create a bypass to containment, period.

MEMBER SIEBER: Well, an argument the relief valve is not a bypass --

(Simultaneous conversation.)

MEMBER BROWN: Frankly I don't like the 1.5. This came up with --

MEMBER RYAN: I mean, there's a clear way to say what you want. We've got --

MEMBER RAY: Well, I'm trying to say what I want, which is that I don't want to sanction in the reg guide a relief valve that creates a bypass to containment. That's all. On main steam relief valves you damned sure have got to discharge them outside containment, believe you me, because if you put them inside that's a bad design. Okay?

But we've got a lot of other relief valves here, and I just think if they're going to be used this -- to me the only reason to do this is it has got some economic benefit or maybe it's in a lower radiation area than the relief valve would be if it was installed inside containment. It's accessible for maintenance, you know. There are rational reasons why somebody would want to do this. I just don't want to sanction it in the reg guide.

But I've said this every way I can think of now, and I shouldn't go on.

VICE CHAIRMAN ARMIJO: Can you do that without changing Regulatory Position 2?

MEMBER RAY: Sure.

VICE CHAIRMAN ARMIJO: I mean, if you have Regulatory Position 2, those words, the configuration on page 25, which I guess is a worst configuration, would still be acceptable.

MEMBER RAY: Yeah, both the closed loop and the open system I find troubling. Obviously, the open system more so. I simply wouldn't use a relief valve in a forward flow direction as a containment isolation valve full stop.

MEMBER BROWN: Then the rule ought to be changed.

MEMBER RAY: I wouldn't sanction it in the reg guide is what I meant to say rather than I wouldn't use it.

MEMBER BROWN: But how can you have it both ways? If you don't say something and they come in and they do it that way anyway --

MEMBER STETKAR: But then the staff has to look at it as an exception.

MEMBER RAY: In the context of everything we have.

MEMBER BROWN: Yeah, but they approve all of the exceptions.

PARTICIPANTS: No, they don't

MEMBER RAY: If you want to go further, Charlie, we could, but that's not what I'm --

MEMBER CORRADINI: I guess I'm in Harold's camp with the principle; that if it appears in the reg guide as an acceptable practice, that's a road too far, but if the staff wants to go through some sort of review of a specific case by case analysis, I trust the staff to know they're not going to do something unusual.

VICE CHAIRMAN ARMIJO: But they'd be hard pressed to withhold approval. If somebody comes in and says, "Here's my configuration. It's a 1.5," it's totally consistent with your Regulatory Position 2. How could the staff say, "Go pound sand" unless they change Regulatory Position 2?

MEMBER RAY: Well, Sam, I think on that score that is to me a little different debate than just the issue of what's included in the reg guide. I think it does go further. It's a legitimate issue to discuss, I think, but I don't think we either have to let it in the reg guide as is or do nothing.

VICE CHAIRMAN ARMIJO: Well, it sounds like this is kind of a poor practice that not too many people use, at least the configuration on page 25. So it's really rare because there's much better ways to do it.

MEMBER RAY: It shocked me when I saw it.

VICE CHAIRMAN ARMIJO: And so probably that won't happen. The other ones are the closed loop. Quite a few people use it.

VICE CHAIRMAN ARMIJO: I guess.

MEMBER RAY: I don't know.

VICE CHAIRMAN ARMIJO: I don't know.

MEMBER SIEBER: I don't know whether it is or not, but I --

(Simultaneous conversation.)

MEMBER SIEBER: but I don't know.

CHAIRMAN ABDEL-KHALIK: Why would it be very difficult to change Position 2 by eliminating the use of --

MEMBER STETKAR: Or the forward flow.

CHAIRMAN ABDEL-KHALIK: Right.

MR. DENNIG: We could take it out of the SRP at the same time or something. I don't think we could have it in the Standard Review Plan and not put it into the reg guide. That sort of sends a mixed message.

CHAIRMAN ABDEL-KHALIK: Correct. You've got to take it out of both if you're going to do it.

VICE CHAIRMAN ARMIJO: Correct, yeah.

MR. DENNIG: And to take it out of both --

CHAIRMAN ABDEL-KHALIK: Is that a rulemaking?

MR. DENNIG: -- the Standard Review Plan would have to somehow be revised in some going forward fashion.

VICE CHAIRMAN ARMIJO: Future applications.

MR. DENNIG: Some grandfathered fashion.

MEMBER SIEBER: I don't like that.

MR. DENNIG: And applied in that way because there's no way we're going to go back.

VICE CHAIRMAN ARMIJO: No, that's not right.

MEMBER BROWN: It just doesn't make a whole lot of sense to continue to do something that --

PARTICIPANT: That's not right.

MEMBER BROWN: -- not right in the future regardless of what we accepted in the past.

MEMBER RAY: One more time. I don't think this is a judgment about what's right and wrong --

MEMBER BROWN: Acceptable.

MEMBER RAY: -- as much as it is what should be sanctioned in the reg guide. Now, the point about, oh, well, if we don't put it in the reg guide now we've got to take it out of the standard review plan, and that's something may be we don't want to do and we'd only have to do it on a going forward basis, not on a past history basis.

Well, to me that's a complication the staff can worry about. I'm just -- the reg guide is here in front of us and not the standard review plan.

MEMBER STETKAR: Take out the phrase that says "or the forward (relief) flow direction."

VICE CHAIRMAN ARMIJO: But we can recommend a change in the wording of that position and the staff can do what they want.

MEMBER BROWN: Exactly, if we want.

VICE CHAIRMAN ARMIJO: And the SRP.

PARTICIPANT: So we can say it shouldn't be issued unless the exchange is made.

VICE CHAIRMAN ARMIJO: Going forward, and I think the going forward makes sense.

(Simultaneous conversation and laughter.)

MR. DENNIG: And we stand ready to respond to whatever feedback we get. That's why we go through this

MEMBER SHACK: But, I mean, you do need a regulatory position because as it now stands, the standard would let you use it.

MR. DENNIG: So if you don't put the 1.5 in, then you need a statement that says "thou shalt not."

MEMBER RAY: Well, now, that's an interesting point, Bill. I'm not sure that's right, but you may be right.

MEMBER SHACK: He's right.

MEMBER RAY: Why do you think so?

MEMBER SHACK: Because I can't find anything in the standard that forbids you from doing it.

PARTICIPANT: Okay, but there is an ANSI standard.

MEMBER SHACK: In the existing reg guide there isn't anything that sanctions doing it either.

MEMBER RYAN: It doesn't matter.

MEMBER SHACK: Well, no, it does matter. In the existing reg guide it's superseded by the Standard Review Plan, and that's what they're trying to do is to make the two consistent.

MEMBER RAY: Well, that's an interesting

point. If the reg guide is superseded by the Standard Review Plan, then I defer to your --

(Simultaneous conversations.)

MR. DENNIG: -- all of the guidance into one place, into the reg guide.

MEMBER RAY: If I'm an applicant, I don't refer to the Standard Review Plan. I refer to the reg guide.

MR. DENNIG: The reg guide is a more public --

MEMBER RAY: If I'm an applicant.

(Simultaneous conversation.)

CHAIRMAN ABDEL-KHALIK: One discussant at a time, please.

MR. DENNIG: -- that goes with it, but it is not the sole summary of all staff guidance.

MEMBER SIEBER: Yeah, but it's sort of a higher category than Standard Review Plan.

MEMBER BROWN: The reg guide is.

MEMBER SIEBER: For staff guidance.

MR. DENNIG: The purpose of the review program, why we're doing this is to make it easier for licensees to know what is acceptable to the staff.

MEMBER SIEBER: Right.

MR. DENNIG: And in one place it's in the

SRP it says okay, and in the reg guide it's silent on the matter.

MEMBER BONACA: If you put it in the reg guide, somebody will implement it.

MEMBER BLEY: Who wouldn't have?

MEMBER BONACA: I would bet my bottom dollar.

MEMBER RAY: I don't want to put relief valves inside container. They are hard to get to. They're in some God-awful place I can't reach. There's a man-rem exposure. You know, there's all kinds of reasons I don't want them in there. I'll put them all outside if I can.

MEMBER BROWN: And that's the point. That's what will happen.

MEMBER RAY: I know. Sitting in this chair I don't want that to happen.

MR. DENNIG: I don't know that there's a pent-up demand to do this sort of thing. I think as Jerry indicated it has been a kind of a backfit issue and how do we do this.

MEMBER CORRADINI: But if I just wanted to make sure, just to make sure I understand your point, your point is that if you were to be bold enough to accept the fact this is not acceptable practice, you would have to then make the SRP consistent with the language in the reg guide, and then you'd have to make some sort of -- this is not our problem of the day, but then you'd have to make some sort of decision of what's already in existence and how you'd grandfather those things versus things going forward.

MR. DENNIG: Yeah, basically is it okay or not, and for 30 years we've said it's okay. And we would have to argue that it's not okay.

MEMBER SIEBER: You can do that on a backfit basis though because the cost of the modification is substantially more than the cost of doing it right in the first place.

MR. DENNIG: Right, but we're not going to be able to backfit this on anybody.

MEMBER SIEBER: No, and because the cost-benefit probably wouldn't support it, right?

MR. DENNIG: That would be my belief.

MEMBER SIEBER: Yeah.

MEMBER SHACK: Well, if it's not a backfit, you know, the question is, you know, if somebody came in, would they accept it today to do it. I assume most of these were done on this thermal relief problem. That's the main reason. You had a bigger concern about losing the pipe than you did about putting in the relief valve, and you know, my guess is you might come to the same judgment.

But I don't think there's a pent up demand, as you say, and you know, presumably new reactors wouldn't do this.

MEMBER STETKAR: Presumably they wouldn't unless something happens in the future and they need to.

MEMBER SHACK: Well, in which case if it's the least evil.

MEMBER RAY: If you had the choice, either a new plant or an existing plant, if you had the choice to protect the pipe, and that is the point which is a potential or actual containment boundary, by putting the relief out inside containment, why on earth wouldn't you from a containment bypass standpoint? Because you --

MEMBER SHACK: That's true.

MEMBER RAY: -- accomplish the goal.

MEMBER SHACK: You would.

MEMBER RAY: Of course you would.

MEMBER SHACK: And I think everybody designing a new plant would do that.

MEMBER STETKAR: You know, Bill, I would have thought people doing it with old plants would have done that, but apparently they didn't.

MEMBER SHACK: It is a question of, you know, what you -- you know, how far do you regulate the design?

MEMBER RAY: This is containment. To me it's a sacred kind of thing.

CHAIRMAN ABDEL-KHALIK: I think by taking it out of the reg. guide we are just not sort of giving a blanket approval of the design. What we are saying is if somebody wants to do this, it would have to be evaluated in detail by the staff, and the decision then would be made as to whether or not it's acceptable.

MEMBER BROWN: Yeah, but they live with the 1.5 set point, that it becomes like water off a duck's back. They just accept it.

PARTICIPANT: And the burden would be on us to explain why --

MR. DENNIG: It is not acceptable.

PARTICIPANT: -- guidance is guidance -- why it's not appropriate to be consolidated in the regulatory guide. What is the hang-up? Why aren't you doing that?

MEMBER BONACA: Well, you could describe, you know, in the reg guide why certain configurations such as this are not as desirable and, therefore, they should not be accepted for going forward.

MEMBER BLEY: And there are places in reg guides where there's guidance similar to that of that says, you know, unless it's not practical to do this, go the other way.

The point John brought up is something as we started doing PRAs and started looking at things beyond the design basis, people were kind of astounded and said these things weren't designed for that condition, but they do pretty darn well for it.

Well, if we put 20 of these bypasses in that are going to let go if we get one of those cases, we aren't licensing for beyond design basis, but still why sanction something that puts you in trouble in that oddball condition that you don't have to? And I'd like the idea of something in here saying it's certainly not preferred unless it's -- unless there's some extreme reason to do this. If you have to, you can do it.

MEMBER POWERS: What you can do is you can say here's a configuration that we've allowed, and all you risk is this, and just show them the bypass accidents' source term and explain to them the fatalities you're going to have from this and say, "Your option."

MEMBER SIEBER: That's a different approach.

MEMBER POWERS: Please, go ahead, and oh, by the way, we'd like you to publish this in the local newspaper.

MR. DENNIG: Well, it seems to me that you are going to comment on this and the choice to make is to --

MEMBER RAY: Regrettably since I have the right to comment.

MR. DENNIG: Is to figure out a way that it's subject to comment or approve it with comment. In other words, this is okay, but it would be better if you did this or this is not okay because, and we don't want it going out this way. That's kind of the choices.

MEMBER SIEBER: Yes.

MR. DENNIG: And I don't think we have anymore wisdom to divulge as far as this. It is one of those things that's been established, and --

VICE CHAIRMAN ARMIJO: Can you change words in a regulatory position without a rulemaking process?

MR. DENNIG: Oh, yes.

VICE CHAIRMAN ARMIJO: So why wouldn't you just change the words and take out the forward direction and going forward?

MR. DENNIG: Well, I was talking more in terms of forbidding some configuration, being explicit about saying no to something as opposed to leaving the door open for something, but having a different threshold.

VICE CHAIRMAN ARMIJO: But the regulatory position is a permission.

MEMBER SHACK: Except it's not to the standard.

VICE CHAIRMAN ARMIJO: Well, no, you have to change the standard.

MEMBER SHACK: Well, the standard isn't going to change.

MEMBER RAY: No, the industry standard is what it is. The industry standard doesn't apply to the core direction.

VICE CHAIRMAN ARMIJO: We can't change a review plan.

MEMBER SHACK: It's not clear.

MEMBER BLEY: I think it is.

PARTICIPANT: I do, too.

MEMBER SHACK: Industry standard.

MEMBER RAY: It says in the backflow direction, but not the forward flow direction.

MEMBER SHACK: Yes, but if --

MEMBER RAY: When it says the backflow is okay to me and it doesn't say forward flow, then --

VICE CHAIRMAN ARMIJO: Then it means the forward flow is not okay.

MEMBER RAY: That's right.

MR. DENNIG: Except, and then somebody thought about it and said, "Well, what's wrong with this?" and say, well, it has got this bypass capability, and somebody said, "Well" --

VICE CHAIRMAN ARMIJO: I'll crank up the chip.

MR. DENNIG: Yes, make sure the set point is not going to open.

VICE CHAIRMAN ARMIJO: Yeah.

MEMBER RAY: No, I meant the industry standard didn't incorporate that process.

VICE CHAIRMAN ARMIJO: But NRC did..

MEMBER RAY: That's right.

MR. DENNIG: I'm sure we were -- this is speculation here -- I'm sure that we --

MEMBER SHACK: The '84 version of the standard explicitly allows it in the forward direction.

VICE CHAIRMAN ARMIJO: You have instantly found the '84 version?

(Laughter.)

VICE CHAIRMAN ARMIJO: That's incredible.

MEMBER BROWN: Is that what you're talking about? This says --

MEMBER SHACK: No, I'm looking at the '84.

MEMBER BROWN: This is the '76.

MEMBER SHACK: The '76 is --

MEMBER BROWN: Allows it in the forward direction as long as the set point is greater than 1.5. It says it.

MEMBER SHACK: It's not so clear in the '76.

MEMBER BROWN: It explicitly says "provided that." "Or the forward flow direction as isolation . . . provided that the release set point is greater that 1.5."

MEMBER SHACK: That's not the statement in the ANSI standard.

MEMBER BROWN: Well, that says 3.6.6.

MEMBER SHACK: But that only refers to the things in quotes.

MEMBER BROWN: Oh, I missed the quotes.

I'm sorry. I got excited.

MEMBER SHACK: Yes. I am only looking at the document.

(Simultaneous conversation.)

MEMBER RAY: I'm sorry.

MR. BETTLE: We've exhausted this point.

MEMBER RAY: I agree entirely. Excuse me for letting this degenerate.

Anything further? You guys have said you said all that you wished to, but I don't want to prematurely cut things off.

MR. BETTLE: On relief valves, the only thing that would be left in the presentation is to go through the remaining laboratory positions, and the Subcommittee meeting --

MEMBER RAY: Well, the full Committee should have the benefit of that, too.

MR. BETTLE: Okay.

MEMBER SHACK: Just to be absolutely precise, what it says in the '76 version of the standard on this, "It is intended to prepare a supplement or separate standard, which will address certain topics not covered in the initial issue of this standard, such as accident isolation and guidance on the use of relief valves in the forward flow direction as containment isolation valves."

So it's --

MEMBER BLEY: Opening the door.

MEMBER SHACK: It's opening the door. It hasn't said yes. It hasn't said no.

MEMBER RAY: Thank you.

MEMBER STETKAR: But in the '84 standard it explicitly says yes.

MEMBER SHACK: In the '84 standards --

MEMBER STETKAR: But, again, they're not talkinga bout the '84 standardS.

MEMBER SHACK: Does it say, yes, you can use it, and it says 1.5?

MR. BETTLE: Yes. Fifty percent.

VICE CHAIRMAN ARMIJO: They probably picked it up from the regulatory position.

MEMBER SHACK: Now that I haven't found yet.

MEMBER RAY: But he will. Well, while Bill is looking, why don't you guys go ahead because we ought to hear everything?

MR. DENNIG: We reference the '76 version.

MEMBER SHACK: But you're consistent with the '84 version actually.

MR. BETTLE: Okay. Regulatory Position 1, I briefly touched on that one when we were looking at one of the graphics that you can utilize instead of the Appendix J local leak rate test. You can do a -- on the closed system, you can do like a system leakage test as long as the pressure is above containment accident pressure.

And then we move to Slide 29. This is brought in from the Generic Letter 96-06. I mentioned that before. It says the licensee "shall provide thermally induced over pressure protection for liquid filled piping between containment isolation barriers inside containment and damage on the pipe against isolated . . . can demonstrate that the pressure between the isolation barriers cannot exceed the design pressure of the isolation barriers of the design pressure of the piping."

And any thermally induced over pressure protection method should be with consideration of the maximum, maximum pressure in containment or the back pressure, however the pressure is being relieved.

Now, a number of the things that people did that's not necessarily just putting on a relief valve, you can engineer those valves, the containment isolation valves, so that they will relieve and protect the pipe either by internally disc deflection or just easing off the seat or even in at least one case they engineered the body bottom bolts so that they'll stretch out and they'll take the excess pressure out between the --

CHAIRMAN ABDEL-KHALIK: Well, on the next page for this Reg Position 3 --

MR. BETTLE: Yes.

CHAIRMAN ABDEL-KHALIK: -- doesn't this statement -- isn't this statement inconsistent with the discussion that we had before where it says any thermally induced over pressure protection method that the licensee uses should provide such protection inside containment?

MEMBER SIEBER: It puts the relief valve inside.

MR. BETTLE: Well, if you have your containment accident pressure inside and you have your relief valve on the inside, you still have that section to put penetration piping between containment and the outboard valve.

Now, you have a higher back pressure on that relief valve through the containment accident pressure inside --

MEMBER SIEBER: So it won't relieve.

MR. BETTLE: -- so it won't relieve and

you put your pipe outside.

MEMBER RAY: You've got to consider it. Yeah, absolutely.

CHAIRMAN ABDEL-KHALIK: I mean, that statement is inconsistent with Regulatory Position 2 with that argument because you can put the relief in between the two valves and relieve it inside containment. That's what this means.

MEMBER BLEY: Yes, I think you're right.

MEMBER RAY: You can, yes. Maybe I'm not following the question.

CHAIRMAN ABDEL-KHALIK: I am just wondering if this statement here eliminates all the arguments that we had before on Position 2 and essentially makes those funding configurations unacceptable.

MR. DENNIG: I think this refers to where the line is that the protections are not where the relief valve is put.

MEMBER RAY: Yeah.

MR. DENNIG: It's to relieve inside containment, and where it relieves to is not the issue in that statement.

MEMBER BLEY: but it's still saying that the over pressure protection is affected by the discharge back pressure of the relief valve, and they need to consider that so that if the discharge is into containment, you've got to consider containment pressure as affecting the set point of the relief valve.

MEMBER SIEBER: Right.

MEMBER BLEY: That's the way I read it.

MEMBER SIEBER: But if there's going to be a break, the break will be outside containment because inside you've got the balancing of pressure on the piping also.

MR. BETTLE: Right. So you rupture the pipe outside.

MEMBER SIEBER: So it's going to be between the isolation valve and the containment penetration.

MEMBER RAY: Yes, but if the discharge is outside containment, then you don't experience containment back pressure on the tailpipe.

CHAIRMAN ABDEL-KHALIK: Well, I guess, you know, you can read this sentence in many different ways, and the way I read it, I put the emphasis on the word "inside." So "should provide such protection inside containment," and then the rest of it is sort of additional information.

MEMBER SIEBER: Well, it's not obvious to me that people will think far enough when you put the relief valve inside to recognize that you now boosted the relieving pressures and that over pressurizes the piping outside or could over pressurize it.

CHAIRMAN ABDEL-KHALIK: I don't know. It seems like you can read this statement in a way that forces people to provide those relief valves so that they would relieve inside containment.

MEMBER RAY: I don't know. I'd have to think about that. I don't think that was the intent of the language, but there is something now to leapfrog over my friend across the table here that I've had the benefit of our staff's input on, and I thank him for that.

There is in the standard additional provisions --

MEMBER SHACK: The '84 standard.

MEMBER RAY: Yes. Excuse me. The '84 standard, additional provisions that are relevant. "The reseating pressure of the relief valve used in this manner shall be at least 95 percent of the set pressure." That doesn't appear here I don't believe.

"And the following," which is kind of like what Dennis said. "The use of relief valves in this manner should be minimized and should be used only when there are no satisfactory alternatives to either the system design or the selection of valve type."

Now, that seems --

(Simultaneous conversation.)

MEMBER STETKAR: I like that.

MEMBER SIEBER: I like that.

MEMBER RAY: Now, that at least I realize that this is not the basis for the reg guide, but because this language does appear, am I correct, Bill? I've got the right spot? That's the kind of thing we've been talking about, but it does clearly --

MEMBER SHACK: But it could be added to the reg guide.

MEMBER STETKAR: It could be added to the reg guide, and it doesn't require necessarily a change to the SRP.

VICE CHAIRMAN ARMIJO: You could reference that instead of the '76 and then that provides the guidance you really want.

MEMBER RAY: So thank you.

MEMBER BLEY: You don't even need to refer to this. The reg guide can say it's their position. They've got to change the standard, and there may be other things in the '84 standard that would be --

MEMBER RAY: Well, we could just --

MEMBER SHACK: Yeah, you don't have to refer to the '84 standards. You can just take this language and put it in the reg guide.

MEMBER BLEY: That's what I was trying to say, yeah.

PARTICIPANT: Oh, I thought you were saying refer to the

MEMBER SHACK: That would be too hard.

MR. DENNIG: But if you take this and go back and look at the '84 and tee everything up.

VICE CHAIRMAN ARMIJO: You can extract the language and put it into the reg guide.

MEMBER RAY: But that does convey what concerned many of us, I think, and it was not yet in the reg guide.

CHAIRMAN ABDEL-KHALIK: Okay.

MR. BETTLE: Regulatory Position 4, "sealed closed isolation valves are under administrative controls and do not require position indication in the control room." It also talks about power operated valves should have position indication in the control room.

Of course, they can be considered sealed closed if, you know, you're closed and then deenergized in the closed position.

MEMBER BROWN: But by "sealed," just to calibrate me from this commercial industry standpoint, does that mean like they've got a cap and a lock wire or something like that?

MR. BETTLE: A lot of them in the past have been, but CFOs, a lot of that goes now to administrative. Like if it's a power operated valve, you --

MEMBER SIEBER: Pull the power.

MR. BETTLE: -- you close the valve and lock the breaker open.

MEMBER BROWN: Oh, okay. Okay. Well, that's like a lock wire system. It's just a matter of -- okay.

MR. BETTLE: A lot of times it's not like it's a huge restraining device. Just something there to let people know that --

MEMBER BROWN: Yeah, it takes extra effort to change the position.

MR. BETTLE: Think about it before you --

MEMBER BROWN: Okay. Thank you.

MR. BETTLE: Regulatory Position 5, "isolation valve closure shall be completed when isolation signal is received." So it processes the valves closed, you know, to completion, seals in, and you have to remove the originating signal and take deliberate operator action for each of the valves. In that case if the containment isolation signal clears, the valves don't all just pop open, and you don't have, by just doing a single switch positioning you don't pop open a group of valves, you know, kind of like a gang opening operation.

In a lot of systems, of course, you have a potential for water hammer or other problems. So you want a deliberate sequencing of opening so that it gets to the control schematic schemes for the containment isolation valve.

Position 6, it's carried over from the additional reg guide with a few more words added. It talks about the diversity of actuation; include common mode failures. Diversity in the usage of the parameter sensed, and of course, a list of the monetary plan. That's contained in the ANSI standard and specifically identifies as much as is appropriate. Use the high containment pressure, high radiation level in containment, and on the manual, automatic or coincident actuation of ESF, safety feature system, particularly an SI signal, safety injection signal.

Regulatory Position 7,Slide 37. It added in from the SRP Section 6.2.4, that all of your nonessential systems should be isolated on containment isolation signal.

Regulatory Position 8 talks about the criteria for closed systems, and this just expands that out to any branch lines. We show on some of these schematics as far as containment penetration, those are kind of like the simplified version, either inside or outside containment. You can have branching, and then you can have, you know, parallel containment isolation valves. You might have two or three containment isolation valves because the line goes through the penetration and branches before you get to the containment isolation valves.

So this just extends any requirements out to the branch lines.

Regulatory Position 9, this refers out to where you can find information and guidance on combustible concentrations, qualification of Class 1E equipment. I guess originally some of the guidance was imbedded here and in the ANSI standard, and now it's kind of like updating the references there in the N271.

Regulatory Position 10 is basically extending the piping requirements so that you're either meeting the requirements for the piping of the system either inside or outside of containment.

More questions?

MEMBER RAY: We, I think, will now -- perhaps you guys can stand by for a minute -- see if there is other discussion. Dana and I had been up talking about the sacredness, to use that term in its secular sense, of containment, and he just made the comment to me a minute ago, well, then if you're going to do this don't talk to me about the margin that exists in the containment design if you're going to have a relief valve that's set to lift it one and a half times containment.

And that may be implicit in this language. I guess I would just want to test if there's any member that feels, including Dana, that we ought to express more concern than just to suggest the use of this language from the existing standard, which is minimized during this.

CHAIRMAN ABDEL-KHALIK: Can you read those words?

MEMBER RAY: Sure. It does talk about reseating, which is one of the things that does concern me about a relief valve. For example, if you get thermal high pressure, the relief valve opens and stays open and doesn't reseat, and then subsequently you have a need for containment isolation. It's not going to be relevant what its set point was because it opened and didn't reseat.

But in any event, so it does talk about having a reseat pressure of 95 percent, and then it says, "The use of relief valves in this manner should be minimized and should be used only when there are no satisfactory alternatives to either the system design or the selection of valve type."

And again, I think all of us would sign up for that. Perhaps even the sponsors of the reg guide would think that would be a good admonition for people to follow, but the real question is whether there's some more profound thing that we should be cognizant of in terms of use of a relief valve.

We haven't talked about surveillance testing. Do you guys have anything you can suggest to us as we think about, well, how sure are you what the set point of this thing is?

MR. BETTLE: These would be -- the penetrations are considered Code Class 2. So they are in the in-service testing program, ASME in-service testing program. So they are periodically set point tested.

MEMBER RAY: Okay. As part of the ASME ISI?

MR. BETTLE: IST.

MEMBER RAY: IST, I mean. Yeah, example me.

MR. BETTLE: Yeah.

MEMBER RAY: IST testing, and --

MR. BETTLE: And then those are --

MEMBER RAY: There's no position indication requirement on the valve.

MR. BETTLE: Only power operated valves have a position indication requirement.

MEMBER SIEBER: Right, and that valve will be bench tested as part of Section 11?

MR. BETTLE: Yeah, periodically.

MEMBER SIEBER: As opposed to hydro.

MR. BETTLE: Yeah.

MEMBER SIEBER: Right?

MEMBER BROWN: Is there an operating experience database relative to the results of relief valve testing that shows or demonstrates some amount of drift that's commonly observed?

MEMBER SIEBER: I doubt it. If it's bench tested, it's sort of irrelevant because it's not in the environment.

MEMBER BROWN: Whatever. All I know is that when we used to do them in the Naval Nuclear Program, we'd find there was a number of numbers that you'd come up with and you'd find valves out of spec, and so you go reset them.

MR. DENNIG: No, we wouldn't have that.

MEMBER BROWN: We have records, somewhat of a record anyway.

MR. DENNIG: There was a long, long time ago some interest in set point simmer and so on with main steam safety valves, and there may be some information from when that was looked at, but in general I don't believe there's anything that we would have by way of specific results of as-found testing that didn't strike somebody as an inoperability that they would have to report.

MEMBER SIEBER: I remember from my Navy time it hot line, relief valves on hot lines that had the drift as opposed to cold, closed systems, like main steam relief valves. They would drift, whereas a heat exchanger that was close to nominal temperatures --

MEMBER STETKAR: You're talking about opening set point drift. That's not the concern here. It's after it relieves Lord knows what it's relieving. It doesn't reclose.

MEMBER BROWN: Oh, no. There's two thoughts. One was if it drifts low enough, then you're well outside the one and a half.

MEMBER STETKAR: Oh, okay, okay.

MEMBER BROWN: So yeah.

MEMBER STETKAR: Okay, yeah.

MEMBER BROWN: And I agree, I understand the reseating issue. That has always been a concern after they open. How well do they reclose?

MEMBER RAY: I guess the no satisfactory alternatives is language that I just now was made aware of. I should have known sooner, I guess, but that seems like a pretty strong admonition to me. It's just why isn't there an alternative.

MEMBER SHACK: -- then, you know, this isn't such a bad idea.

MEMBER RAY: Yeah, I mean, if there's no satisfactory alternative and the issues is protection of the integrity of the pipe, then you know, it's like, well, I don't have any alternative. It's just I must have an alternative. So just don't do it would be my better choice.

But in any event I come out and we've got a time this afternoon or this evening to go over the proposed letter. So at this point my take-away from the Committee would be to come back with a letter that would call for this language to be included in the reg guide.

okay. I'm done.

MR. DENNIG: So that would be a "subject to incorporation" rather than "recommends."

MEMBER RAY: I did note your distinction, and I was going to think about that --

MR. DENNIG: Okay, all right.

MEMBER RAY: -- without trying to say.

MEMBER SHACK: But I think we're pretty close to subject to incorporation.

MEMBER RAY: Exactly. If the standard felt it was appropriate to call for that, why shouldn't we?

MEMBER SIEBER: It could be "amends, with added comments."

MEMBER RAY: Well, let's not go there unless we have to. Okay?

MEMBER SIEBER: Okay.

MEMBER RAY: Let's see if I can't come up with a satisfactory letter.

MEMBER SIEBER: You will.

MEMBER RAY: I'm down here.

CHAIRMAN ABDEL-KHALIK: Thank you.

At this time the schedule calls for us to go to lunch break. So we will take a lunch break and we will reconvene at 1:00 p.m.

Thank you.

(Whereupon, at 11:33 a.m., the meeting was recessed for lunch, to reconvene at 1:00 p.m., the same day.)

AFTERNOON SESSION

(12:59 p.m.)

CHAIRMAN ABDEL-KHALIK: We are back in session.

At this time we will discuss Draft Revision 1 to Reg Guide 4.11, Terrestrial Environmental Studies for Nuclear Power Stations, and Dr. Ryan will lead us through this discussion.

MEMBER RYAN: Thank you, Mr. Chairman.

On December 16th, the Subcommittee, Health Physics and Nuclear Materials, heard a presentation from Mr. Peyton Doub, who is the scientist on this project, on the proposed revision to Reg Guide 4.11 on terrestrial environmental studies for nuclear power plants. I think the subcommittee's views were that it brought together a lot of disparate requirements and aspects of environmental terrestrial ecology studies that are now all in one place for the new plants to use, and I think we thought that it was an interesting briefing, and I hope you find it the same.

We have a draft letter prepared as a result of that briefing. So without further ado, I'll introduce Mr. Doub and ask him to give you a presentation, please.

MR. DOUB: Thank you very much.

Good afternoon. My name is Peyton Doub, and I'm a terrestrial and wetland ecologist with the Environmental Technical Support Branch of NRO.

I was hired by the NRC in 2008 to review terrestrial ecology and wetland issues connected with licensing applications for new reactors. Prior to that time, I had spent 20 years in the private sector as a consulting ecologist and wetland scientist supporting various government agencies and developers, including power plant developers.

From 2006 to 2008, I had been hired by two NRC applicants to perform wetland delineations and other terrestrial ecology studies for two proposed new reactors that are presently the subject of NRC applications.

One of my first assignments with NRC was to write a revised version of Regulatory Guide 4.11, Terrestrial Environmental Studies for Nuclear Power Stations. Reg Guide 4.11 provides the guidance to licensed applicants on how to conduct terrestrial ecology studies and analyses for inclusions with license applications, especially in support of or as a part of the required environmental report.

Applicants submit environmental reports as part of their application, and the NRC staff uses technical information from the ER to go with other technical information to prepare the environmental impact statements that the agency must prepare to comply with the National Environmental Policy Act, or NEPA, prior to conducting federal actions, such as issuing combined licenses or early site permits under 10 CFR Part 52.

VICE CHAIRMAN ARMIJO: Mr. Doub, would you just please bring me up to date? Who else reviews these environmental reports and documents that the licensees for a nuclear plant prepare? Does EPA also review those things and accept them or is this solely within the NRC's purview?

MR. DOUB: As is true with all environmental impact statements, the EIS will be filed with the EPA.

VICE CHAIRMAN ARMIJO: Okay.

MR. DOUB: But the federal agency is the NRC. As it turns out, we actually on a number of applications for new reactors have a cooperating agency, the U.S. Army Corps of Engineers. So they work with us as part of a review team reviewing the application, preparing the environmental impact statement.

VICE CHAIRMAN ARMIJO: But acceptance of

the environmental report, is that solely within the authority of the NRC?

MR. DOUB: The substance of the environmental report is solely within the NRC.

VICE CHAIRMAN ARMIJO: Okay. Thank you.

MEMBER SIEBER: That's subject to public hearing also, right? That can be a contested item in the license application.

MR. DOUB: I believe it can be, yes.

MEMBER SIEBER: The state has a lot of involvement because they issue all of the discharge permits.

VICE CHAIRMAN ARMIJO: Okay. I just wanted to know who.

MR. DOUB: As you know, Reg Guide 4.11 is one of several regulatory guides to the NRC staff preparers to write specific technical guidance on specific elements of the license application. Reg guides do not constitute rulemaking and applicants are not required to follow them. However, reg guides assist applicants by showing them an approach to technical analysis that is acceptable to the NRC staff reviewing applications.

Applicants who see this approach as contrary to that of a reg guide should indicate to the staff why the alternative approach meets regulatory requirements.

Reg Guide 4.11 was first published in July 1976 and last officially revised in August 1977. It addresses terrestrial ecology, technical studies and analyses that may have to be submitted by licensees or license applicants to the NRC over the life cycle of a nuclear power plant. The scope of Reg Guide 4.11 includes terrestrial but not aquatic ecological studies.

I began drafting the proposed new revision, which will be called Revision 2 in July 2008 with input from other staff ecologists in NRC and other NRC offices and NRC contractors. The resulting internal draft was published in ADAMS in October 2009 as Draft Guide 4016. The Subcommittee invited me to present Draft Guide 4016 to the Subcommittee members in a public meeting on December 16th, 2009.

The slides I used are posted on the ACRS portion of the NRC Website.

The December presentation included a detailed overview of the history of Reg Guide 4.11, the objectives for the new revision, and a detailed summary of the proposed new revision. Copies of the proposed new revision were provided.

I answered questions from the Subcommittee and other attendees and received a series of oral comments.

I must point out that Regulatory Guide 4.11 does not directly address how licensees write terrestrial ecology material for inclusion in the environmental reports or how the staff addresses terrestrial ecology in the environmental impact statement. However, the staff would like Reg Guide 4.11 to indirectly improve the terrestrial ecology data included in environmental reports and environmental impact statements by improving the supporting studies and analyses that form the technical basis for the terrestrial ecology text in the ERs and EISes.

For example, habitat maps and wildlife data included in ERs and EISes must be attained from supporting documents that initially present the information. It is those documents that are covered by Reg Guide 4.11. By improving the quality of those supporting documents, Reg Guide 4.11 can indirectly improve the technical quality of ER and EIS sections that draw on information contained in the supporting documents.

Although the revised Reg Guide 4.11 is

expected to benefit new reactor applications the most, it may also assist applicants for license renewals as well.

This slide illustrates the position of Reg Guide 4.11 in relation to other NRC environmental guidance documents. Reg Guide 4.11 provides guidance to licensees on preparing terrestrial ecology supporting studies and analyses.

Reg Guide 4.2 provides guidance to licensees on how to actually prepare the environmental report, including, but not limited to, those portions of the environmental reports that deal with terrestrial ecology.

NUREG-1555, the Environmental Standard Review Plan, provides guidance to the staff reviewing license applications and preparing environmental impact statements

MEMBER SHACK: Now, are Reg Guide 4.2 and 1555 applicable to both new plants and license renewal or is there different guidance?

MR. DOUB: They are applicable to both, but there are supplements that address license renewal.

MEMBER SHACK: And how often would I have to repeat my terrestrial studies?

MR. DOUB: That would depend on the particular study. A lot of studies are done that are one time studies that are baseline studies, but there could be monitoring studies that require the collection of data over multiple years during the operating life of the plant.

So why revise Reg Guide 4.11 now? Well, I heard a chuckle when I noted that the previous revision was dated 1977, more than 30 years ago. The scientific knowledge base has grown substantially since then.

Even more importantly, federal and state regulations covering terrestrial ecological resources, especially wetlands and endangered species, are much tighter now or at least more tightly enforced since 1977. Many new field and analytical techniques have been developed to collect and analyze terrestrial ecology data since 1977.

NRC staff have noted substantial variability both in general approach and quality in the terrestrial ecology technical supporting studies and analyses performed by license applicants in the current round of 18 new nuclear reactor license applications accepted over the last two years.

Reg Guide 4.11 is so out of date the NRC staff have advised license applicants to look in the ESRP, Environmental Standard Review Plans, for guidance on terrestrial ecology studies and analyses.

Furthermore, there is a need to make the terminology used in Reg Guide 4.11 consistent with corresponding terminology in Reg Guide 4.2 and the ESRPs.

More applications are expected in the future. NRC staff hopes that the revised Reg Guide 4.11 results in improved terrestrial ecology supporting studies and analyses and ultimately better environmental reports that better assist NRC staff in reviewing applications and preparing environmental impact statements. Hopefully the revision will reduce the number of requests for additional information, or RAIs, related to terrestrial ecology that staff will have to issue in the future.

MEMBER APOSTOLAKIS: Can you elaborate a little bit on this -- go back -- need to define terrestrial aquatic boundary? What does that mean?

MR. DOUB: Yes. The 1977 Rev. 1 of Reg Guide 4.11 is limited to dryland terrestrial habitats. There is, as you probably know, the transition between terrestrial and aquatic habitats, is usually not a sharp boundary, but it's usually a gradual boundary with a broad transition zone that's commonly referred to as wetlands. So wetlands are an extremely important functional habitat that exists in kind of a no man's land between traditional terrestrial ecology and traditional aquatic ecology.

So we're hoping that Reg Guide 4.11 will include the dryer spectrum of the wetlands in the terrestrial studies while reserving the wetter portion of the wetlands for future aquatic directions.

MEMBER RYAN: I think one of the things the Subcommittee addressed, and we'll talk about it a little later, is we're thinking that we ought to recommend that there be a complementary reg guide for the aquatic terrestrial, for the aquatic environment as well. So this is one part of the whole.

MEMBER APOSTOLAKIS: But the way it's done right now, how is that handled? Just the terrestrial?

MR. DOUB: Unfortunately, Reg Guide 4.11 is very vague with respect to wetlands, and that's one of its shortcomings.

MEMBER APOSTOLAKIS: But what do people do? Do they actually include wetlands?

MR. DOUB: They do because they are required to get wetland permits from the Army Corps of Engineers. So their consultants know that they have to address wetlands.

However, that need is not reflected in the current guidance from the NRC. So we're hoping that the revised Reg Guide 4.11 will provide them with the comfort of knowing that the NRC understands --

MEMBER APOSTOLAKIS: Cares.

MR. DOUB: -- their need to provide proper information on wetlands.

MEMBER RYAN: And to take it one step further, you know, many plants being located on large bodies of water, one wants to know the aquatic environmental.

MEMBER APOSTOLAKIS: So it's not going to change dramatically what people are already doing. It's just that you're codifying it a regulatory guide.

MR. DOUB: Yes. As a matter of fact, one of our objectives was not to imply that there's a greater need for effort beyond that that's currently the norm. We simply want to officially state in Reg Guide 4.11 what we believe the successful applicants are currently doing.

MEMBER APOSTOLAKIS: Okay.

MR. DOUB: So these are the specific objectives for Rev. 2. We're already gotten into that. Rev. 2 is intended to update Reg Guide 4.11 to reflect the current state of terrestrial ecology, scientific knowledge, and research practices. Users will be able to use Reg Guide 4.11 in conjunction with other NRC environmental guidance documents.

Like the previous revision to Reg Guide 4.11, Revision 2 does not outline step-by-step procedures in a cookbook fashion, but instead explains general data need and helps direct users to appropriate sources of technical data and procedural direction.

For example, Rev. 2 does not explain how to conduct a wetland delineation, which is the process of mapping wetland boundaries, but instead refers the reader to the wetland delineation manual and supplementary guidance published by the U.S. Army Corps of Engineers for their wetland permitting program.

Rev. 2 seeks a balance between specificity and flexibility. Considering that Reg Guide 4.11 has not been revised in more than 30 years, it is hoped that Revision 2 will remain useful without needing future frequent revision.

So what exactly does Reg Guide 4.11 cover? Ecology is the science of how living organisms interact with themselves and with their physical surroundings. Truly terrestrial habitats on dry land were the subject of past versions of Reg Guide 4.11 and will, of course, be addressed in Rev. 2. Truly aquatic habitats, such as streams, lakes and rivers, were not addressed in past revisions and will not be addressed in Rev. 2.

However, Rev. 2 will include wetlands, those transitional habitats between dry land and aquatic areas, if they support emergent, i.e., erect, vegetation. Such areas are ecologically more similar to terrestrial than to aquatic habitat.

However, Rev. 2 does not address wetlands containing on submerged vegetation which are more aquatic in character.

MEMBER APOSTOLAKIS: So I take it you took all these pictures.

MR. DOUB: Yes, sir. Thank you.

MEMBER APOSTOLAKIS: That's it.

VICE CHAIRMAN ARMIJO: I've got to ask a question. The applicant has to analyze what's on his site or his proposed site, and if it happens to be wetlands, that's great. If it happens to have a stream or a river adjacent to it, he has to analyze that up to the edge of the river or --

MR. DOUB: Well, it takes professional

judgment to determine the possible extent or region of influence of environmental impacts. So there is no sharp cutoff that they only study what's on site and not off site.

The technical consultants that the applicant employs has to have the professional judgment and knowledge to understand the breadth of the impacts off site.

VICE CHAIRMAN ARMIJO: So you had better -- I was thinking in terms of the aquatic issue. You know, if he happens to have a river right adjacent to his site boundary or running through his site.

MR. DOUB: Typically they take a watershed approach. You know, they can break string systems up in the watersheds and sub-watersheds.

VICE CHAIRMAN ARMIJO: Okay.

MR. DOUB: Because obviously, you know there is even a less sharp boundary between aquatic habitats than there is terrestrial habitats. However, terrestrial habitats also are, even though they appear to have sharp boundaries on the map, the actual transitions between the habitats are quite gradual and fluid much like aquatic habitats were, and the fluidity is much more intuitive.

MEMBER STETKAR: I apologize. I came in a few minutes late. So you might have mentioned this already.

MR. DOUB: Not a problem.

MEMBER STETKAR: But you mentioned a couple of times wetlands under the Army Corps' definition. How do you address -- as I understand it there is state-to-state variability in definitions of what is a wetland. I'm kind of familiar with New York State, and I believe their definitions of what encompasses a wetland is even broader than what the Corps might apply.

I might be wrong there.

MR. DOUB: Actually it's a little more restrictive as to what constitutes a wetland according to the New York State definition versus the federal definition.

MEMBER STETKAR: Okay.

MR. DOUB: But it is different in some states. New York is one example.

MEMBER STETKAR: What I'm worried about --

MR. DOUB: And Florida is another example that we deal with, you know, that we've been dealing with for a new reactor.

MEMBER STETKAR: Are there going to be

difficulties in terms of resolving state level definitions of wetlands versus Army Corps or is this in terms of following the guidance?

MR. DOUB: Applicants need to address both federally defined wetlands and state defined wetlands, as well as what are commonly called non-jurisdictional wetlands, which are wetlands that meet the technical criteria for vegetation, soil and hydrology of wetlands, but do not fall within the regulatory definition of the Corps and/or the state for various political purposes.

MEMBER STETKAR: Okay.

MR. DOUB: So there may in some applications be three tiers of wetlands considered: federal wetlands, state wetlands, and non-jurisdictional wetlands.

MEMBER SIEBER: Well, it seems to me in that regard the environmental impact statement is prepared by the applicant and submitted to the staff.

MR. DOUB: The environmental report is prepared by the applicant.

MEMBER SIEBER: Right.

MR. DOUB: Then the staff uses information now in the environmental report, as well as other sources and their own professional judgment to write the environmental impact statement.

MEMBER SIEBER: But whose set of rules do you use? Federal set, Army Corps of Engineers, the state, you know?

MR. DOUB: Well, the NRC does not directly regulate wetlands.

MEMBER SIEBER: Right.

MR. DOUB: The NRC only has to consider impacts to environmental resources of which wetlands is one type.

MEMBER SIEBER: Right.

MR. DOUB: So we do not as an agency have an official NRC definition of wetlands, but we have to consider possible impacts to what other sectors consider to be the wetland, but we do not directly issue wetland permits.

We do, however, as I said previously, invite the Army Corps of Engineers to participate in their environmental impact statement as a cooperating agency. That way instead of each agency having to prepare a separate environmental impact statement, the two agencies can benefit from a single team effort on one environmental impact statement.

MEMBER STETKAR: but by doing that don't you implicitly adopt the Corps' definition of a wetland within the scope of what you're writing the EIS for?

MR. DOUB: No, because the EIS has to meet the requirements of both the NRC and the corps and both agencies make their own separate decision.

MEMBER RYAN: There's a more analytical example of stuff like this in the MARSA manual, the multi-agency annual that guides decommissioning EPA, NRC, Corps of Engineers have all decided the MARSA manual is how everybody is going to assess the samples and come up with clean or not clean decisions.

So not only federal agencies, but state agencies are involved.

MEMBER STETKAR: That's where the state comes in, where the EPA --

MEMBER RYAN: The state can go because MARSA is okay. Now, they may want to have the benefit of review or they may want to participate in some way, but the technical basis is all pretty much the same, and I think it's not dissimilar here. This art of the practice requirement and norms in terrestrial ecology, and I think the hard challenge is not to decide on those and whether we adopt a law or regulation, but these are the technical norms, and we are all going to cooperate to use those to make the judgments.

Is that a fair summary?

MR. DOUB: Yes, sir.

MEMBER RYAN: Thank you.

MR. DOUB: The December Subcommittee presentation summarized in detail the technical contents of proposed Revision 2. Time is not available for me to repeat that detailed technical summary now as much as I'd like to.

As I stated previously the slides from the December presentation are available on the ACRS portion of the NRC Website, and the text of Draft Guide 4016 is available on ADAMS.

The overall organization of Revision 2 follows the sequence of terrestrial studies and analyses that might have to be performed over the course of the life cycle of a nuclear power plant beginning with siting, then proceeding to baseline data collection, identification of important species and habitats, then to ecological impact analyses during construction and operation, then ecological monitoring that may have to be considered over the operating life of the plant and finally concludes with decommissioning.

The organization generally parallels that of the original 1977 version of Reg Guide 4.11. Rev.

2, like the previous revision, includes in scope only terrestrial ecology issues associated with licensing nuclear power plants, not issues associated with licensing fuel facilities, to address one of Mr. Ryan's concerns.

MEMBER SIEBER: Is it true that decommissioning requires a separate EIS or is that all --

MR. DOUB: It's a separate action. It's a separate action that would require a separate NEPA document, whether it be an EIS or an EA, which is a shorter version of an EIS.

MEMBER SIEBER: Right.

MR. DOUB: So in the last presentation, I went through each phase of the proposed Rev. 2 in a lot of detail. Here I'm just going to hit on a few high points. With respect to siting support, staff have had to issue a number of RAIs, request for additional information, on how terrestrial ecology was considered when evaluating alternative sites for the current round of proposed new reactors. Especially with the need for controversial wetland permits from the U.S. Army Corps of Engineers for most reactors, a requirement that did not exist in 1977, and our involvement of the Corps as a cooperating agency in the most new reactor environmental impact statements, careful consideration of terrestrial ecology especially related to wetlands is necessary when selecting the range of alternative sites for evaluation in an ER and an EIS.

The new rev., like the past rev. of Reg Guide 4.11, recognizes that terrestrial ecology analysis performed during the siting stage rely mostly on published data sources rather than site specific field data collection. However, Rev. 2 will provide direction on a number of new terrestrial ecology and wetland data sources that are available on line or in other readily accessible formats.

Consistent with the objective of having Ref. 2 steer readers to published methodologies rather than repeat those methodologies in the text, Rev. 2 informs users of the availability of the EPRI siting guide for nuclear facilities and explains how terrestrial ecology can be considered during the use of this guide, but it does not repeat the contents of the guide.

It is hoped that Rev. 2 will retain its utility even when EPRI issues future update to their siting guide.

The moving path siting to baseline

investigation, which is the area that I was involved with as consultant to the outlands before I was hired with the NRC, a number of terrestrial ecology baseline and analyses are usually needed to support most new reactor license applications, especially those that occur on greenfield sites or portions of previously developed sites that presently support natural vegetation.

These baseline studies may be the subject of stand alone reports cited in the environmental report or the data may be written for the first time directly as part of the environmental report. Examples include development of terrestrial habitat maps and descriptions, flora and fauna surveys, and wetland delineations.

The ESRPs emphasize the value of identifying important species for both terrestrial ecology and aquatic ecology, and important species per the ESRP definition include but are not limited to federally and state listed threatened or endangered species, regionally rare species, keystone species essential to the function of regional ecosystems, and commercially or recreationally valuable species.

Identifying important species helps the author of the ER further direct ecological efforts, assist in regulatory compliance and may help direct future ecological monitoring.

Finally, there's a need to reform studies and analyses related to the impacts from construction and operation of nuclear plants on terrestrial ecology. Like baseline studies, these impact analyses may be the subject of stand alone reports or that are cited in the ER or the data from the impact analyses may be presented for the first time directly as part of the applicant's environmental report.

Once a plant is constructed, the need for terrestrial ecological study does not necessarily cease. There may be a need for monitoring. Most monitoring requirements related to terrestrial ecology are established by federal and state natural resource regulatory agencies rather than directly by the NRC. The requirements may be established in one or more federal or state permits or possibly as mitigation measures in the EIS or very rarely as NRC license conditions.

Finally, the last phase of Reg Guide 4.11 deals with decommissioning nuclear power plants and terrestrial ecology issues in decommissioning. Impact on decommissioning may be beneficial to terrestrial ecological resources as well as potentially adverse.

Terrestrial ecology data from past efforts, especially the baseline studies maybe very helpful in assessing impacts from decommissioning and developing site restoration guides for the site during decommissioning.

So having given you a very quick tour of Revision 2 to Reg Guide 4.11, I want to hit upon a few of the key comments that were raised at the Subcommittee meeting on December 16th. I was told first of all to make sure that Revision 2 calls out Reg Guide 4.2 on environmental report preparation and provides some direction on the connection between Reg Guide 4.11, Reg Guide 4.2, and the ESRPs.

The commenter stated that the specificity that I provided in Rev. 2 is quite desirable and that it should be a road map for applicants that will help to minimize the potential for future RAIs.

Another commenter asked that I include a discussion of how products produced following Reg Guide 4.11 using Reg Guide 4.11 will be used by the NRC to comply with NEPA.

Another commenter asked that Revision 2 clearly state that Reg Guide 4.11 is specific to nuclear power station licensing and does not apply to other NRC licensing such as fuel cycle activities.

And then another commenter stated that I should be careful in the use of words such as "may," "can" and "recommend." So those were some of the key comments, and there were also some other comments that were made during the December 16th presentation.

So where do we go from here? Following this presentation, I plan to edit Draft Guide 4016, which is my draft version of Rev. 2, Reg Guide 4.11, to incorporate comments that I received in the past, plus any comments that I might receive today. Any comments received following today's presentation will also be considered.

While Draft Guide 4016, i.e., Rev 2. to Reg Guide 4.11, has received internal concurrence from the Office of New Reactors for publication, it is still awaiting possible comments from the Office of Nuclear Reactor Regulation. NRR may have comments based on comments that they received on terrestrial ecology portions of their recently published draft generic environmental impact statement.

Once all internal comments are received and incorporated, Draft Guide 4016 will be noticed in the Federal Register and made available for public comments.

Following action based on the public

comments, Draft Guide 4016 will formally go into effect as Revision 2 to Reg Guide 4.11. NRO at that time will encourage future new reactor license applicants to use Rev. 2 and will monitor how successful Rev. 2 is in reducing the need for future RAIs related to terrestrial ecology. NRO will also consider, as Mike stated, the possible future development of a companion to Reg Guide 4.11 that addresses studies related to aquatic ecology.

Thank you very much for this opportunity to speak, and we've had some great discussion thus far and it looks like we have plenty of time for additional questions.

MEMBER RYAN: Questions, comments?

Again, I want to thank Mr. Doub for a very good presentation. As an almost brand new but not quite brand new employee to the Agency, his interactions with the Committee were very well done, very thoughtful, and I think are reflected in today's meeting. So we really appreciate your hard work with us. It will make our letter writing -- and that's the form our comments will take: here's a letter from the Committee.

So I'd open up the floor for questions.

MEMBER SHACK: There's no guidance at all now for the aquatic studies? I mean, we're not talking about revising. This is a whole new reg guide you're talking about for the aquatic studies.

MR. DOUB: It would be a new reg guide. There is some guidance on aquatic ecology as with all environmental resource assessment topics in Reg Guide 4.2, and there is some guidance in Reg Guide 4.2 on terrestrial ecology as well, but there is no equivalent to Reg Guide 4.11 that addresses those aquatic support studies.

And as was noted at the December presentation, which is entirely true, many of the more controversial impacts connected with nuclear power stations are not always terrestrial. They are many times aquatic.

VICE CHAIRMAN ARMIJO: But in the standard review plan, the applicant has to address aquatic issues.

MR. DOUB: Absolutely.

VICE CHAIRMAN ARMIJO: So he's got to get that from what's in the Standard Review Plan or experts in the field or --

MEMBER RYAN: Or other agencies in states or federal agencies, and I think the points the Committee came to in the discussions with the presenter was that a companion reg guide would be very helpful to applicants to help pull all that together as this one is for the terrestrial side of the house.

Yes, please. Tell us who you are.

MR. CLAYTON: I'm Brent Clayton. I'm Mr. Doub's Branch Chief in NRO. After --

MEMBER STETKAR: There's a little switch -- you can't find it -- on the bottom.

MR. CLAYTON: Okay. Is this one working?

PARTICIPANTS: Yes.

MR. CLAYTON: Good. I'm Brent Clayton. I'm Mr. Doub's Branch Chief in NRO. After over 30 years on the safety side of the house in NRC, I started doing environmental work about three and a half years ago. So I'm not an expert in this area, but according to the people who are who have been around for a long time doing environmental work, it has been the intent of the staff to provide a reg guide on aquatic similar to 4.11 for many years. The reason there's one for terrestrial and there's not for aquatic is they had people who had time to do it, and a limited number of aquatic specialists have always been busy doing license amendments or license renewal work.

But it's our intent if we ever get the

chance after we get through this current wave of applications that we will do a more detailed reg guide, but as somebody stated, there is guidance in Reg Guide 4.2 that tells people that they have to provide that information in their environmental report, and there's guidance in our Environmental Standard Review Plan that tells us we have to review it, but there's not detailed guidance on how they develop the information they put in their environmental report.

But it is our intent to do that if we ever get a time. Thank you.

MEMBER RYAN: Great.

MEMBER SIEBER: I might add from my experience in the past, the aquatic has been substantially more important from a public standpoint than the terrestrial part, and wetlands is emerging as a very important aspect also, and I think that's driven a lot by the fact that a lot of cooling water sources that nuclear plants use are also drinking water sources for everybody else, and a lot of bodies of water have game fish in them. So fish kills become important. Species, concentrations, and so forth are very significant.

So I would encourage the staff to devote additional attention to the aquatic and the wetlands portion of the environmental studies that are required.

MEMBER STETKAR: Well, and the wetlands become a lot more important if there are new applicants who decide they want to build their own cooling systems, you know, like south Texas, for example.

MEMBER SIEBER: Yeah. Well, and it becomes important from the migratory bird standpoint also.

MR. DOUB: As noted, Rev. 2 of Reg Guide 4.11 will include wetlands with emergent vegetation.

MEMBER SIEBER: Okay.

MEMBER RYAN: Any other questions from members?

(No response.)

MEMBER RYAN: Okay. All right. Thank you very much, Mr. Doub.

MR. DOUB: Thank you.

MEMBER RYAN: We will be writing a letter some time during this meeting on this topic. So you're welcome to come and watch that process, or not.

(Laughter.)

MEMBER RYAN: Thank you very much for a

very informative presentation on your work in December.

MEMBER APOSTOLAKIS: And congratulations for your pictures.

MR. DOUB: Well, thank you.

(Laughter and simultaneous conversation.)

MEMBER BLEY: By the way, George, if you had been here for the Subcommittee, there was a slide that talked about bird electrocution.

VICE CHAIRMAN ARMIJO: It's in this one.

MEMBER BLEY: Oh, was it there?

VICE CHAIRMAN ARMIJO: Yeah.

MEMBER APOSTOLAKIS: But this has nothing to do with electrocution.

(Laughter.)

CHAIRMAN ABDEL-KHALIK: Our schedule calls for us to begin our next presentation on the status of rulemaking for disposal of depleted uranium at two o'clock, and since this has been published, we have to start our next presentation at two o'clock. At that time Dr. Armijo will chair the meeting since I have to be away for a while.

So we will take a break till two o'clock, and we'll start our next agenda item at that time.

(Whereupon, the foregoing matter went off the record at 1:40 p.m. and went back on the record at 1:59 p.m.)

VICE CHAIRMAN ARMIJO: As soon as I know what we have, if we have people listening in and want to make some comments later, I'll let you know.

In the meantime I'd like to have Dr. Ryan lead us through this presentation.

MEMBER RYAN: Thank you, Mr. Chairman. I appreciate that.

Before we do begin, I might ask if there is anybody on the bridge line and could you identify yourselves?

MEMBER BLEY: They can't talk.

MEMBER RYAN: Oh, they can't talk? Are they on mute mode?

MEMBER BLEY: I think so.

MEMBER RYAN: All right. Well, they're in mute mode and we'll catch them at the end. Thank you. Sorry.

Without further ado, let me introduce Patti Bubar, who is the Deputy Director of FSME. Thank you very much, if I get that right, and please.

MS. BUBAR: Thank you.

Well, thanks for the opportunity to be able to do this.

As Mike said, my name is Patti Bubar, and I haven't had an opportunity to get to know any of you. So hopefully as a result of this meeting I can begin that process of starting to get to know you.

I am in the Office of Federal and State Materials Environment Program, and I'm in the directorate that is called the Environmental Protection and Performance Assessment Directorate. So we basically do anything that has to do with waste, performance assessment, as well as environmental reviews under NEPA.

So I appreciate this opportunity to speak with you a little bit today about depleted uranium. Back in December one of our staff, Pria Yattiv, who is now off of maternity leave, spoke to the Waste Management Subcommittee on the status of DU activities, and I'm going to provide a follow-on to that early presentation and give you some updates, but I'm actually going through a lot of the same presentation that she gave to the Subcommittee.

I'd like to say I'm joined today by Chris McKenney and Chris Grossman, but that's not true. They're coming any minute, I'm sure, but the handsome stand-in Mike Lee is sitting here with me.

MR. LEE: I'll be Chrises.

MS. BUBAR: You can be one of the Chrises or both.

MEMBER RYAN: Well known to us all.

MS. BUBAR: Next slide. Do I do that? Are you going to be a pretty face? I'll put you to work here.

I'll give a little bit of background and then I'll talk about Commission direction that we've received and what we're doing as a result of that direction, the status of that. We've had some workshops and I'll give you a summary of those workshops whether we gather some very interesting public input, and then I'll talk about next steps.

Just by way of background as to what we're doing, we actually are using the term "unique waste stream" here to capture what we're calling significant quantities of depleted uranium because it's different from the types of commercial low level waste that we are generally familiar with and, frankly, that was analyzed when Part 61 was put together.

So in a sense it's a new waste stream because when Part 61 was put together there were no significant quantities of depleted uranium being generated. At the time Department of Energy was the only entity operating enrichment facilities in the

United States, and so it's only small quantities of DU were being produced and at lower concentrations than is the case that we're being faced with today.

So the Part 61 scoping effort was limited to what was produced at that time, and this is back in the '80s.

Depleted uranium is also unique because it behaves differently than typical commercial low level waste. In general the hazard for most commercial low level waste will decrease over time. The hazard associated with depleted uranium. However, it persists for a much longer time frame due to the ingrowth of the daughter products.

But nevertheless, the impacts from the management of the disposal of significant quantities of depleted uranium can be mitigated by either increasing the burial depth --

MEMBER RYAN: Hold on that point. I think the word "hazard" there has been misused. It's not the hazard. It's the inventory of radioactive material.

MS. BUBAR: yes, yes.

MEMBER RYAN: There's no hazard unless there's a pathway to exposure. So I think it's important to recognize absolutely directly as the inventory of progeny grow in, but I guess I'm not sure there's a direct proportion that's a directly proportional hazard.

MS. BUBAR: yes. Good point.

MEMBER RYAN: Thank you.

MEMBER BANERJEE: But it can be leached out.

MEMBER RYAN: It can be, but, you know, I think to have an a priori assumption that the inventory by definition is the hazard is not exactly right.

MS. BUBAR: Right.

MEMBER BANERJEE: Well, hazard is defined as the potential to do damage.

MEMBER RYAN: By some, but not by all.

MEMBER BANERJEE: This has a potential to do damage.

MEMBER RYAN: We all have the potential to be millionaires.

MEMBER BANERJEE: A lot of things happen, but anyway, this is a --

MEMBER RYAN: Sorry, Patti.

MS. BUBAR: Okay This slide here, we actually used this in our presentation back in December.

By the say, this is Chris McKenney. Thank you, Chris, for joining.

MR. McKENNEY: Hi.

MS. BUBAR: And he is our Branch Chief in the Performance Assessment Branch, whose staff is doing all of this or has done all of this technical work that I'm telling you about and is continuing to work on this. So welcome, Chris.

So this is just a little illustration to illustrate the management challenge that we would face with large quantities of depleted uranium. It shows the ratio of the activity of DU compared to similar ratio for commercial low level waste as a function of time.

MEMBER CORRADINI: Just can I understand? The one that's the dotted line or the dashed line, that's the assumption that there is no radioactive daughter products at time approaching zero, and the daughter products just build up.

MS. BUBAR: Right.

MEMBER BANERJEE: Which in reality --

MR. McKENNEY: You still have a minimum at any time now.

MEMBER CORRADINI: I'm sorry?

MR. McKENNEY: You have very minimal

amounts of any daughter products any substantial hundreds of years after having extracted the uranium from the rest of the process, making it into metal or burning it through the fuel-fab process and then letting it sit around for 24 --

MEMBER CORRADINI: So the assumption is that time close to zero I have performed some sort of manufacturing process. It has removed all of the daughter products, and took what was approaching ten and took it back to one, and now it's going to re-get up to ten.

MR. McKENNEY: Right.

MS. BUBAR: Right.

MEMBER CORRADINI: Got it.

MR. McKENNEY: And all of those daughter products are sitting in other parts of the states.

(Laughter.)

MEMBER CORRADINI: Sitting where?

MR. McKENNEY: At all of the uranium mills around the site.

MEMBER BANERJEE: And all the mill tailings.

MR. McKENNEY: Yeah. That's right. I grew up near one.

(Laughter.)

MEMBER SIEBER: But this is not mill tailings.

MR. McKENNEY: No, no, it's not. This is several -- this is much more concentrated than mill tailings.

MEMBER SIEBER: This is enriched plant waste.

MR. McKENNEY: Metal or uranium oxide. So it is --

MEMBER CORRADINI: Well, I just wanted to understand what one meant. That's all.

MS. BUBAR: So as you can see, it's around the 1,000 year mark that it's relatively constant until the 1,000 year mark, and then it would be, you know, some time after a million years where you start to see the peak increase. So that's the uniqueness of depleted uranium.

Back when the LES facility was being licensed and there were the hearings, intervenors had filed contentions regarding the impact from depleted uranium disposal. So in response the Commission directed the staff to evaluate those impacts independent of the LES hearings. They did proceed with issuing the LES license, but this direction was provided in this CLI-05-20 to evaluate this issue of depleted uranium, and --

VICE CHAIRMAN ARMIJO: Excuse me. In that case, what did LES plan to do with their depleted uranium? What form did they plan to dispose of?

MS. BUBAR: They planned to --

VICE CHAIRMAN ARMIJO: Turn it into an oxide or metal or something?

MS. BUBAR: Yes, oxide.

VICE CHAIRMAN ARMIJO: And bury that?

MS. BUBAR: Un-huh, and so it will be de-converted and then they plan on disposing what's left.

MEMBER CORRADINI: I'm sorry. This is just more background. So they have to do that or can they perform like DOE and just leave it all a UF-6 gas and decide later?

MR. McKENNEY: Well, actually DOE right now has started de-converting their own facilities.

MS. BUBAR: Well, their facility is almost up and running.

MR. McKENNEY: Up and running, and they will be this summer, I think.

MEMBER CORRADINI: But it was a choice on their part, economic choice, not a requirement, but it was eventually a requirement to do that on the --

MR. McKENNEY: One was a switch in what

part of DOE held the material, and that they had exhausted most possible chances to utilize as a resource anymore, and so it was starting to make the choice that there was just not enough. It was more of a waste from their point of view than a resource anymore because of the costs associated with it.

MEMBER CORRADINI: Right. So in this case, with the LES, it's part of their plan just to get it back to some sort of form that's a floor to UF-6.

MS. BUBAR: Right. And there are applications that are coming in for commercial facilities to do that de-conversion, International Isotope's thing. One of them we just received their application, but there's also a provision under the USEC Privatization Act that calls for USEC having to take, for instance, LES' depleted uranium and de-convert it and then be responsible for its disposal with, you know, LES paying the price.

So those are the two options that LES would have for getting their material de-converted and be able to be disposed of.

So what we're talking about is, you know, where can it be disposed of after all that happens.

MEMBER CORRADINI: Thank you.

MS. BUBAR: So the specific direction in the order, the Commission emphasized that we consider the quantities of depleted uranium that would potentially be disposed of, and noting that these quantities were outside the bounds of the earlier scoping on Part 61.

So in response to that Commission order, we prepared an analysis and that was in what's called SECY-08-0147, and the content of that was we prepared a technical analysis evaluating the impacts of near surface depleted uranium disposal. We provided four possible regulatory approaches to the Commission, and we identified a preferred option.

MEMBER BANERJEE: What form is uranium in seawater?

MEMBER CORRADINI: It's an oxide, chloride.

(Laughter.)

MEMBER BANERJEE: Concentrations or what?

MR. McKENNEY: Concentrations are minimal, but --

MEMBER BANERJEE: Ppm?

MEMBER CORRADINI: The same as the earth's crust.

MEMBER RYAN: No, it's less.

MEMBER CORRADINI: Less? But still ppm, yes?

MEMBER RYAN: Yes.

MEMBER CORRADINI: Okay.

MEMBER BANERJEE: You can't just dissolve it into the sea.

MR. McKENNEY: No, no.

MS. BUBAR: No.

MEMBER BANERJEE: Why not? Because you will make no difference whatsoever, right?

MR. McKENNEY: It's a huge -- well, it's a metal processor. Back to what is the proper solution for it? It can be made into a solid form, and should that be disposed of in the process?

MS. BUBAR: That was not one of the options.

MR. McKENNEY: That was not one of the options, but it also -- the question on that level, whether that also dealt with the treaties on sea disposal of waste.

MEMBER RYAN: I was going to point out there is an ocean dumping ban.

MR. McKENNEY: Which is why we don't have waste sites in the first place.

MS. BUBAR: That's right.

MEMBER BANERJEE: It probably would make no difference whatsoever.

MEMBER CORRADINI: No, but I think the point that Chris made just now is historically, long, long ago, that's where all low level waste went, into ocean dumping.

MEMBER RYAN: And then in the '60s they made a treaty ban, and then all of a sudden we had low level waste sites and most all of them opened up right at the same time as that treaty went into effect.

MEMBER SIEBER: Without intending to waste time, did I understand military wastes are sometimes in the form of metal? And, for example, the China Lake issue --

MR. McKENNEY: Yes.

MEMBER SIEBER: -- in California where the Navy had artillery shells made out of depleted uranium. China Lake became a big clean-up project.

MR. McKENNEY: We had that. There's various military applications that have used depleted uranium which they've required to buy the depleted uranium from DOE, but that's a small fraction of the numbers, and that generally when you deal with clean-ups from those sites, while they are metals, they are mixed in with a lot of soil because it's just the rounds having been shot all over the place, and you go out and try to clean up the site. So you pick up a lot of other stuff, and so the average concentration of the DU from those activities is very much smaller and the volumes still are actually still not comparable still to the DU at the other site.

MEMBER SIEBER: Well, my comment leads to a question. It seems to be depleted uranium as a metal would be better than depleted uranium as an oxide or a fluoride, which is obviously no good from the standpoint of chemical stability.

MR. McKENNEY: Right.

MEMBER SIEBER: So why don't they go to that step and then figure out how to dispose of it?

MR. McKENNEY: Actually the uranium metal can, and depending on what environment it is, can oxidize quite quickly and degrade. The JPG site actually has a lot of degraded rounds you can find, but --

MEMBER SIEBER: Yes.

MR. McKENNEY: -- you are right. The de-conversion facilities as designed right now and the reason why they go to oxide was not necessarily as that was the optimal disposal method.

MEMBER SIEBER: Right.

MR. McKENNEY: The de-conversion facility that was designed for USEC was designed actually to stabilize the material in a form that would be readily usable again if it was needed to be used for something else so that they could build de-conversion facility, then decide what to do with the material. This is when it was planned back in the decades ago. So that oxide was chosen as the flexible choice basically of the coming out of de-conversion facilities.

MEMBER SIEBER: And so when you talk about DU now, you're talking about an oxide?

MR. McKENNEY: Right.

MS. BUBAR: Right.

MEMBER SIEBER: For the same reason or is it the economic reason that you don't want to undergo another chemical transformation?

MR. McKENNEY: Right, right. Well, it's more to the fact that currently that is the planned mass of material, not necessarily is that the best. We think that in what we're doing it requires a site specific performance assessment. Some may evaluate whether they want to make requirements of what waste form would be appropriate for their site, and they may evaluate that aspect because of the fact that as a powdered uranium oxide, which is what is going in the canisters, if you follow the process for this de-conversion facility that may not be the most practical or possible solution.

And so that they could reevaluate whether they need to have yet another step before you allow land disposal at a specific site.

VICE CHAIRMAN ARMIJO: What form of oxide are we talking about? U-308, U-02, some other?

MR. McKENNEY: It's a mix. It's effectively U-308, which is actually a mixture of UO-3 and UO-2, but it's U-308.

VICE CHAIRMAN ARMIJO: In powder form, not pelletized or compacted in any way?

MR. McKENNEY: Yeah. No, it's very fine powdered form. So massive surface area. All sorts of issues from a disposal point of view.

VICE CHAIRMAN ARMIJO: Which is not a good thing.

MR. McKENNEY: Yeah.

MS. BUBAR: Yeah, I think -- is International Isotopes planning the same type of technologY? Yeah.

MR. McKENNEY: Yes.

MEMBER SIEBER: And so from a groundwater standpoint it's susceptible to migration?

MR. McKENNEY: Well, the particle size should be bigger, but it's susceptible to migration from the fact that you get water contact time onto the maximum amount of surface area, and then that can dissolve into the water.

MEMBER SIEBER: Right.

MR. McKENNEY: And so, yeah, they may want to have to deal with that in a site specific nature to say what sort of waste form would be better at a site. That was not our charge as much as to say what is the best waste form. Our charge was could you dispose of depleted uranium in the near surface at all, not necessarily what is the best economic or --

MEMBER SIEBER: But if permanent disposal was the goal with the minimum of environmental impact at a reasonable cost, it seems to me like this is a little on the superficial side, given the fact that activity levels are going to increase as opposed to low level waste which increases.

MR. McKENNEY: In general, yes.

MS. BUBAR: Well, as Chris said, our charge was to basically look at whether this could be disposed of in shallow land burial. So that was really -- we developed a screening model for unique waste streams, and that was Chris' staff. He did that, and that analysis methodology was developed to be consistent with the original Part 61 analysis. It was a probabilistic screening model to evaluate the radiological risks and uncertainties associated with near surface disposal of large quantities of DU at a generic disposal site.

VICE CHAIRMAN ARMIJO: How can you do that unless you know the form, the chemical form, the physical form, whether it's in a container and all of those other --

MR. McKENNEY: Right. that's where we simplified in this case, and we did use mostly as an oxide form powdered as what is -- could you do it with the oxide form in the canisters as a first step?

VICE CHAIRMAN ARMIJO: Okay.

MR. McKENNEY: Before going to is there better performance from other waste forms, saying that this one probably has -- other than salt, green salts, has probably some challenges in allowing you to meet the standards in an oxide powdered form in a canister is what we assumed.

But honestly, the canister lifetime is nowhere near anything that per performance you need anyway. So usually carbon -- we don't usually even assume that carbon steel lasts any appreciable time.

VICE CHAIRMAN ARMIJO: It will last a long time. I'll talk to you later.

MEMBER CORRADINI: But I think what he's saying in the time scale of worry, it doesn't exist. That's what I think you just said.

VICE CHAIRMAN ARMIJO: Well, if you have a million year criterion, you know, I'd agree with you, but if you're talking about hundreds of years, thousands of years, there's plenty of material.

MEMBER SIEBER: One thousand, I think, is the --

MR. McKENNEY: Right, right, right, but again, when you get into that, there's a tradeoff in how much effect are you having versus what's your level of justification to say that all of your canisters are not leaking or are not penetrating in some way.

VICE CHAIRMAN ARMIJO: That's kind of the Yucca Mountain trap that we got into where nothing can survive. No engineered barrier can survive, and I kind of see that happening here with depleted uranium.

But your assumption is it's in some container that's just convenient for initial disposal, but it's going to disappear and all of this powdered depleted uranium will be available for leaching and whatever.

MR. McKENNEY: Right, right.

VICE CHAIRMAN ARMIJO: Okay.

MS. BUBAR: Right, and we analyze the generic disposal site as opposed to, you know, picking any specific commercial disposal site.

MEMBER RYAN: Could you talk a little bit more about what the characteristics of a generic site were?

MR. McKENNEY: We have two generic -- in the original DES there's effectively two original sites. One was an arid site and one had the humid characteristics to look at the two different results.

The disposal technology used at these sites was assumed to be consistent at first. We looked at different depths, but the most simplest trench design in the EIS has got like a three-foot cover on top of it with the waste right below that, accessible.

MEMBER RYAN: So you're moving the topsoil down to the waste is three feet?

MR. McKENNEY: Yeah.

MS. BUBAR: Yes.

MR. McKENNEY: That's the minimum depth in the EIS. Then we, of course, evaluate deeper. For today's activities out there, there's quite a bit of difference between what the EIS evaluated and what is performed on a site specific basis by these sites now. There's a number of parameters that are different in all of those cases. So --

MEMBER RYAN: Just so the rest of the Committee understands, the EIS you're talking about is the 1979 environmental impact statement.

MR. McKENNEY: Up till 1981, yes.

MS. BUBAR: Yeah. So that's what we started with and then talk about what we did in our analysis.

MR. McKENNEY: Right, right.

MEMBER RYAN: It's not the one you're working on now. It's the one --

MR. McKENNEY: No, no, no. Sorry.

MEMBER RYAN: -- low level waste back when --

MS. BUBAR: To support the Part 61.

MR. McKENNEY: Rulemaking. So yes.

MS. BUBAR: So do you want to talk about what we did in our analysis as far as the generic?

MR. McKENNEY: So we looked at both the fact that both major pathways of possible exposure -- we looked at the groundwater release pathway to off sites for the performance objectives in Part 6141. We also evaluated then also, which is a component of the interior dose assessment of assuming the intrusion scenarios in the EIS, which changes. The depth changes. As you get shallower, then you get stuff like basement scenarios possible.

As the cells go deeper, then you have only like well installation or dealing with well cuttings as a chronic scenario, and so they evaluated multiple depths. Our performance period was our guidance from Performance Assessment Working Group, which was developed in the '90s, was that we should be analyzing for 10,000 years and longer than that to look at these peaks and evaluate. In our purposes, we wanted to evaluate where the peak risks were, too.

We looked at 10,000 years and up to a million years for if you kept the same scenario running, didn't actually model glacial movement , climate change or geomorphic changes of the soils and this as a site over the tens of thousands of years, but you set the climate fairly steady. You would evaluate how the dose changed in those scenarios.

MEMBER CORRADINI: So I guess that you're kind of getting into -- I'm sorry. Did you want?

VICE CHAIRMAN ARMIJO: Go ahead, Mike.

You started.

MEMBER CORRADINI: I guess I'm listening. So there is no precedent for the period of performance or is the precedent groundwater, and that's 10,000? I'm still --

MR. McKENNEY: Right. There is actually no policy call on what the time period of performance should be for low level waste. However, in the original EIS, they ran it for 10,000 years, and that's because of --

MEMBER RYAN: For no particular reason.

MS. BUBAR: Right.

MEMBER CORRADINI: But that's what they ran it for.

MS. BUBAR: And that is absolutely one of the things that we'll be addressing as we go forward.

MEMBER RYAN: One of the things I think might help, Mike, is to go back to '79 and '81 when it was finally published in a draft EIS for the second time. I mean, the computing power that we had to do these complex assessment calculations was pretty poor compared to today. I mean, it was primitive compared to today.

So you know, what can be a very complicated mathematical calculation today was sort of impossible to do back then. So, you know, these calculations were really kind of put off, you know, in terms of the assumptions and the bases and the framework for how all of them were done, and you have to kind of say when we're talking about the old calculations, we're talking about things that were done with a technology that was pretty primitive, and we do the same kind of calculations today. We can do all sorts of probabilistic assessments and, you know, time steps and calculations. So to me my point of all that is it's hard to compare the apples and oranges of those two errors of calculational skill and why various assumptions were made.

Back in the '70s the assumptions were made because the computing power couldn't support more complicated stuff.

MR. LEE: Let me just offer one friendly amendment though. In '95 or '96, the Commission voted on a SECY paper that did establish as a matter of policy that low level waste performance assessment per Part 61 would be done for 10,000 years. It hasn't been migrated, if you will, under regulatory space, and that's the distinction.

MEMBER CORRADINI: Well, I guess that's what I wanted to ask. It really is not the purview of the NRC to set that period of performance. It's the EPA, is it not?

MR. LEE: Well, that would be true if there were standards on low level waste, which there are not, and in fact, if you read the Ryan, et al., white paper on low level waste I think it's NUREG-1853. It goes into the history as to why EPA ultimately did not issue low level waste standards. It was the NRC who actually issued them.

MEMBER CORRADINI: Okay. So unofficially somebody has come down to that 10,000 years is a time.

MEMBER RYAN: It's not unofficially. It's a commission policy.

MS. BUBAR: It's a policy.

MEMBER CORRADINI: Okay. Excuse me. I misunderstood.

MS. BUBAR: It's a policy, but not in regulations. There's nothing in our regulation right now that would have that clarity, yeah.

MEMBER CORRADINI: So that's why you went -- the reason I'm asking all of this is I heard you say 10,000 and you tried a million, and I got -- I got nervous.

(Laughter.)

MEMBER RYAN: Me, too.

MEMBER CORRADINI: Because I guess I'll say it on the record. I don't really believe any calculation. So to the extent that --

MEMBER RYAN: You mean any calculation that goes to a million years?

MEMBER CORRADINI: Yes.

MEMBER RYAN: Okay. Because you said any calculation.

MS. BUBAR: I knew what he meant.

MEMBER CORRADINI: I was just trying to get -- because this is the box that another burial issue got in, and the National Academy went and had to give an opinion about it. All that did was make it worse because the EPA took part of the academy's recommendation, not the full thing.

So I'm just wondering are we marching down another path. That's what got me worried. I'm not sure if that's where you were going.

VICE CHAIRMAN ARMIJO: That is exactly what I was worried about, but you know, along these lines, in your figure on page 2, Slide 2, I just want to make sure I understand it. The increase in the activity ratio, is that primarily radon or is it other things?

MR. McKENNEY: It's all the radionuclides.

The fact that there's practically ten radionuclides in the chain is why you get up to about a seven or eight on the ratio.

VICE CHAIRMAN ARMIJO: Now, if the radon is -- you know, for those long periods of time and the canisters have disappeared; your plastics have disappeared; in your assumption is the radon still retained in that waste form or does it diffuse out?

MR. McKENNEY: Well, it's disseminating as it's formed by the radon -- by the radium, from the radium, and its half-life, can it get through the cover in time to get out into the air before it decays again and then it is no longer an airborne --

VICE CHAIRMAN ARMIJO: So the dotted line, does that represent retained radon and all its other --

MR. McKENNEY: That doesn't assume any transport of anything. Now, this assumes that if you have magically a pound of uranium on the seal --

VICE CHAIRMAN ARMIJO: That nothing that's in or out --

MR. McKENNEY: Right. The activity over time will do that.

VICE CHAIRMAN ARMIJO: But in reality if you have --

MR. McKENNEY: In reality the source moves away, and so the source will be decreasing at some rate because it's migrating from the source.

VICE CHAIRMAN ARMIJO: I think it would be nice to see that dotted -- you know, the real --

MR. McKENNEY: Oh, he needs a cite for that.

MEMBER RYAN: As you move from left to right, three things of importance are growing in, the Radium-226, which gives rise to the Radon-222, and then you know, some of the leads and other things down the line, and in time all that does is set the inventory of radionuclides that you somehow deal with in some kind of structured assessment.

VICE CHAIRMAN ARMIJO: If it hasn't diffused out.

MEMBER RYAN: Right.

VICE CHAIRMAN ARMIJO: If the radon hasn't diffused out, if your model was that -- if you took that into account, the activity ratio would decrease with time, wouldn't it?

MEMBER RYAN: Well, I mean, my view is, some of the things we've talked about in the Subcommittee, I don't think you should -- I don't think this curve means much either. I think you have to --

VICE CHAIRMAN ARMIJO: I think it's a little misleading.

MEMBER RYAN: I think you have to risk inform the waste form, the waste package, the disposal technology, the cover technology, and the geohydrologic environment.

Now, I think practitioners take each one of those parts individually to kind of structure the models and studies and so forth, but then at the end of the day the risk is assessed best by integrating all of those elements into one structured assessment rather than trying to pick apart which pieces is operating.

So I think that's the view that I take, is let's do a risk informed assessment as opposed to, you know, making statements like, "Well, this stuff becomes more hazardous as time goes on." Well, I can give you, you know, a big chunk of uranium and put it somewhere that it will never be a hazard to anybody.

So is the inventory of daughter products growing over time? Absolutely. Any sophomore in physics can do that, but you know, where's the risk? Let's get at this in a risk informed way, and I think --

MS. BUBAR: Which I hope is --

MEMBER RYAN: -- to be fair to staff, that's where we're heading.

MS. BUBAR: Yes.

VICE CHAIRMAN ARMIJO: Okay. So then you're in a friendly group.

MS. BUBAR: Do you want to go back to the staff analysis one?

VICE CHAIRMAN ARMIJO: Thank you.

MS. BUBAR: Sure. Well, these are great questions.

So the screening model, and it was just that; it was a screening model to answer the questions that the Commission asked us to answer, which is can this be disposed of in shallow land burial. So it was a screening model. We looked at these key variables and it was a probabilistic assessment using the GOLDSIM model and trying to be as consistent with the original Part 61 analysis as possible

MEMBER RYAN: That may not be a good plan.

MS. BUBAR: Well, it was for comparison purposes.

And here's the results of what we found in the model. If radon gas is included, shallow disposal at an arid site is challenging.

MR. McKENNEY: Shallow disposal here means, just to clarify for language terms -- near surface is described as up to 30 meters of depth.

MEMBER SIEBER: Right.

MR. McKENNEY: And shallow, which unfortunately a lot of people use for the exact same terminology, is actually only for three meters, which is what the shallowest old sites were.

MEMBER CORRADINI: So a way to think of this is a body burial.

MS. BUBAR: Yeah, pretty much. A bit morbid, but it's a good way to look at it.

MEMBER SHACK: Cemetery.

MEMBER CORRADINI: Cemetery site.

VICE CHAIRMAN ARMIJO: But your first statement assumes the radon gas doesn't --

MR. McKENNEY: Well, that the uranium or enough of it stays in the disposal trench over time. Not much of it is actually being -- is leaching out or is leaving the site through groundwater or anything like that.

VICE CHAIRMAN ARMIJO: And getting into the air.

MR. McKENNEY: Right. Well, the radon is the only airborne pathway. So it's only when the radium changes to radon can you have an airborne pathway.

VICE CHAIRMAN ARMIJO: Right.

MR. McKENNEY: So one of our assessors, actual assessors is --

MS. BUBAR: Yeah, this is Chris Grossman. Chris, do you want to -- Chris was one of the modelers on the staff.

MEMBER CORRADINI: To a million years.

MR. GROSSMAN: It's good not to believe in models. It gives you a healthy skepticism.

MEMBER RYAN: Chris, you might want to jump over one because you're going to be the slide operator even though you didn't know that yet.

MS. BUBAR: Yeah, now that you're here, you're stuck.

MR. GROSSMAN: Okay, all right. The question about the first bullet, was the radon gas included, we looked at -- this was kind of coupled with transport. As contaminants dissolve and were transported away, they were no longer available for diffusion to the surface if they got to certain points.

So what we actually evaluated in terms of radon is anything that was left behind. It could potentially recoil out of the solid material into a gas, into the accessible environment, and then as it evolved to the radon gas, migrate to the surface.

But we counter for that diffusion, and one of the scenarios that we actually looked at was if you had some sort of radon barrier installed in your disposal facility.

VICE CHAIRMAN ARMIJO: But wouldn't you want that to happen if you're worried about this activity ratio increasing? I mean actually --

MR. GROSSMAN: We know radon gets into all --

MR. McKENNEY: If the activity stays in the trenches and doesn't go into either groundwater or the air is actually what you want. That's good.

MS. BUBAR: Right.

MR. McKENNEY: That's good because that way nobody can access it.

VICE CHAIRMAN ARMIJO: -- an argument that a million years it's more dangerous than it is today and all of that sort of stuff.

MR. McKENNEY: Only people who can access it.

MS. BUBAR: Right. There's an explicit pathway.

MR. GROSSMAN: Yeah, you're trying to limit its access to the accessible environment, is the intention, and we also looked at transport off site. So once the gas had been released to the atmosphere, it wasn't assumed to hang out there. It was --

VICE CHAIRMAN ARMIJO: Gets swept away.

MR. GROSSMAN: -- swept away, and so you had that.

VICE CHAIRMAN ARMIJO: But we know that happens. That's why we had radon scares 20 years ago or 30 years ago.

MR. GROSSMAN: So I didn't want to give you the conclusion that we were just looking at, okay, this is a decay curve essentially, and it's there and then we suddenly --

MR. McKENNEY: The actual modeling didn't look like that. That was just a thing about half-lives and how activities changed over time of the actual source term.

Now, how risk is compared to that is completely different because now you have to get the material from the trenches or disposal units, if I'm more politically correct, the disposal units, to the accessible environment, and then two major pathways we're looking at here is either through dissolution into groundwater with future well use after that, or intrusion by someone unknowing in the future that either damages the cover such that they can get radiation directly from its current place to where they are or actually brings waste to the surface unknowingly.

MR. GROSSMAN: The third being diffusion of a gas through the cover into the accessible environment above the cells.

MR. McKENNEY: Right, right, right. For this one, yeah.

MR. GROSSMAN: We looked at it, an intruder who entered the site, what exposures they may have both from direct intrusion and access to the waste, but also from the evolution of the gas to the surface and also to an off-site resident who was at the fence line, I believe, that was 100 meters off site as well.

MEMBER RYAN: Chris, tell me. I think I know the answer, but you tell me. The intrusion scenario that you used was like 61, correct?

MR. GROSSMAN: Correct.

MEMBER RYAN: I think it's important for the Committee to understand that that is wildly conservative in every regard; that, you know, somebody is going to build a house on the waste, drill his water well through the waste, captures all of the radon in his house and, you know, develops a radon environment.

So it is not risk informed. It is by its very definition --

MR. GROSSMAN: The limit.

MEMBER RYAN: -- in my opinion, ultra conservative. So I just want to make sure that we understand when we're talking about risk informed versus the old style of 10 CFR 61 ZIS, which is let's assume the worst possible thing for every parameter and calculate that.

MR. GROSSMAN: Yes, for our modeling, we chose a similar path to the Part 61. We looked at a resident who built on site and if the waste was close enough, he may have dug into it with his building's foundation.

And we also looked at a driller scenario.

MEMBER RYAN: Who does that?

MR. GROSSMAN: Drills through the waste to access some resource below the waste.

VICE CHAIRMAN ARMIJO: I've seen the same sort of thing in Yucca Mountain analyses, and instead of leading people to say, "Look how conservative they treat this stuff," it caused great, great fear in a number of people.

I'm from Nevada and have talked to a lot of people, and they showed me these pictures of the intrusion and the barriers falling apart and the radioactivity leaching into their water, and everything else. As engineers, it was a very conservative study. Everybody knew it had many orders of magnitude conservatism, but the public saw it as, "Look. This is a Department of Energy document, color pictures showing how bad it can be. Don't tell me it's conservative."

And so somewhere this conservative approach can really come back to bite us, and I hate to see --

MS. BUBAR: Well, hopefully --

VICE CHAIRMAN ARMIJO: -- depleted uranium wind up just like Yucca Mountain.

MS. BUBAR: Yeah, and hopefully as we go forward, we can be cognizant of that. All of this analysis led us to a recommendation which the Commission has accepted, and that's where we are today.

VICE CHAIRMAN ARMIJO: Well, I'm not attacking. I'm just telling you where I come from.

MS. BUBAR: Absolutely, and that's --

MEMBER RYAN: One other conservatism in 61 is the probability of intrusion 100 years post closure plus zero days is one.

MS. BUBAR: Which the public absolutely believes, which gets to your point.

VICE CHAIRMAN ARMIJO: Yeah.

MS. BUBAR: They think, you know, after 100 years, then everything is gone and all of a sudden we've got to worry about this.

MEMBER RYAN: Right. That's because we assume.

MS. BUBAR: We have created that, yeah, right.

MEMBER BANERJEE: Why are we licensing our reactors for 60 years nowadays?

MS. BUBAR: Don't know.

MEMBER BANERJEE: You know, it's not everything is not gone, obviously, right?

MS. BUBAR: Right.

MEMBER BANERJEE: And the probability of intrusion is probably closer to zero than one.

MEMBER RYAN: I did a probability of intrusion for a particular assessment for a small amount of waste that came from -- potentially came from a source that it should have come from, and the probability of intrusion was like ten to the minus seven.

MEMBER BANERJEE: Yeah, zero.

MEMBER RYAN: Which in reactor space would be ignored.

MEMBER BANERJEE: Yeah. So I don't see why we do this.

MR. McKENNEY: Well, I mean, the consideration is that, one, you've also got to bring another context in to when Part 61 was designed was Love Canal, and it was exactly the same time period as that, too. So there was an assumption made in our rulemaking that you couldn't rely on deeds or institutional controls of any type for very long in the future; that at some point somebody was going to mess it up, and you just --

VICE CHAIRMAN ARMIJO: Sort of Love Canal.

MR. McKENNEY: Right. That's it.

VICE CHAIRMAN ARMIJO: Yeah, but I think we've learned something, you know. These assumptions say the United States doesn't exist anymore. Some prospector after that time period decides to drill into it. It's just outrageous.

MR. McKENNEY: It's much more high

probability. I mean, it's a much higher probability in the shallow --

MEMBER BANERJEE: Had an Ice Age in this.

MS. BUBAR: Yeah, that's right. That's true.

VICE CHAIRMAN ARMIJO: I think the answer to all of this is dependent on the assumptions you made in your analysis, and the more realistic the assumptions, the more comfort I take that we're doing it right, and when we make super conservative assumptions and pile one on top of the other with the intent to show it's still safe, that may be true, but as far as the public, they get the impression that, wow, it's really falling apart.

MS. BUBAR: Right.

VICE CHAIRMAN ARMIJO: And we don't lead them to the right answer.

MEMBER BANERJEE: I agree completely with you. In the reactor business, you've adopted best estimate plus uncertainty therefore. I mean, when you do this, always make conservative estimates. You get ridiculous answers.

MS. BUBAR: Right, right.

MEMBER BANERJEE: And it scares everybody. But if you do a best estimate, which comes out to be ten to the minus seven with a certain uncertainty, that's a different business, and we've got a whole methodology for sampling these things. You know, we use this methodology to determine whether we can cool our reactors.

MEMBER CORRADINI: But be careful. There's a fundamental difference, right? We can do an experiment. They can't do an experiment for what's going to happen in 10,000 years.

MEMBER BANERJEE: But the experiments that we can do --

VICE CHAIRMAN ARMIJO: Some experiments are being done, Mike.

MEMBER BANERJEE: Full scale reactors.

MEMBER CORRADINI: However much I agree with the sentiment, be careful.

MEMBER RYAN: Our job is not to design the PRA for low level waste at the table today.

MEMBER BANERJEE: No, but I think Sam's point is good. We don't want to do another Yucca Mountain.

MEMBER RYAN: I agree with Sam and I agree with you, and I think when we get to the letter writing the view of let's risk inform this in a good way is exactly where we need to go.

(Simultaneous conversation.)

MEMBER RYAN: Just a minute, please. So if I could, I mean, we have a short period of time to let the presenters complete. So let's say we've got enough understanding of the curve and it being a conservative baseline bit of thinking, and if you could move fast forward to, you know, where you are in your recommendations --

MS. BUBAR: Absolutely.

MEMBER RYAN: -- that would be --

MEMBER POWERS: Can I ask a question about this slide?

MEMBER RYAN: Yes, sir.

MS. BUBAR: Please.

MEMBER POWERS: When you do your gas, this radon gas, and you say it comes up in an errant site, it comes up and then it goes away, does it go away as a gas or does it go away as a gas absorbed onto a solid particle?

MEMBER CORRADINI: I was afraid he was going to ask that question.

MR. McKENNEY: Well, it depends on which -- I mean, the radon itself is usually more of like a gas, but all of the daughter products -- and this is the problem, is why radon gas is such a problem in the house -- is the fact that it absorbs. When it decays, all of the daughter products come out as charged and immediately usually glom onto particles around, and then they are -- even though they aren't gases themselves, they are a glom to a small particle, and they can stay airborne enough to then possibly be inhaled later, and that is generally the problem with it.

So the factors we used do have an assumption that the daughter products which are actually the cause of the dose, are connected to airborne particles in the end because of the fact, I mean, that is pretty much how it generally happens in the case, is what you measure in the air, radon, is usually the particles that have been attracted to a particle.

MEMBER RYAN: Chris, you hit on what is a miscommunication, in my opinion, from the EPA that radon is a problem. Radon is not a problem at all. Radon data products are a problem

MR. McKENNEY: Right.

VICE CHAIRMAN ARMIJO: Okay. That's a good point.

MEMBER RYAN: Exactly the physics that he described, that it decays into a solid atom that then is charged and it attaches to dust particles and you inhale the dust. You can inhale radon all day long and guess what's going to happen. It doesn't decay in your lungs. You exhale all of it. It's an inert gas.

MR. McKENNEY: And you don't absorb it.

MEMBER RYAN: You don't absorb it.

MR. McKENNEY: But you might absorb if it's a small particle that gets trapped and then that is sitting in your lung and it decays.

MS. BUBAR: So we'll tackle EPA's communication issue some day and I hope deal with our own now.

So we found that shallow disposal at an arid site is challenging with the definition of shallow as Chris described. For humid sites, basically we found that we would probably exceed the performance objectives.

We need to consider long-term stability and, of course, site specific conditions result in a large variance in dose impacts were the key results.

Next slide, please.

So we looked at four options to provide to the Commission on how to basically go forward and address this disposal of large quantities of depleted uranium based on the fact that the staff's analysis showed that it could be disposed of in shallow land burial with some mitigating factors. Four options were considered.

For the generic communication, which basically doesn't present any legal requirements; that was the first option that was proposed. That would be something like a RIS or an agreement state letter or something like that.

Second option was to conduct a rulemaking requiring site specific analysis.

The third option was basically to develop a generic waste classification. Is depleted uranium Class A, B or C? Because we did not address that in the screening analysis. That was the third option.

And a fourth option was to basically step back and re-examine Part 61 altogether.

So those are the four options that we offer to the Commission.

What we recommended and the Commission agreed was what we call Option No. 2, which was to amend Part 61 to require a site specific performance assessment for DU disposal and develop a guidance document associated with that.

But we also recommended and the Commission agreed -- and this is where I think these opportunities for all of these things that you are advising us on now -- to update or to budget; they asked us to budget, to re-examine the whole Part 61 waste classification framework. And I think that's where we can have the opportunity to step back and look at, you know, doing this in a risk based performance assessment manner and conform with the new ICRP methodologies.

So we are moving forward on both of those, and I think that this direction that we got from the Commission was really an elegant way to move forward, understanding at least from my perspective the overall Part 61 waste classification, re-examine that framework, that is not going to happen overnight. That's going to be, I think, an intensive effort that is going to require, I think, a lot of public education, discussion, discussion with DOE, the international community.

And right now we're budgeting for this direction, and FY '12 is the first year that we're beginning for those resources, but we're anticipating that that would be something like a three to four-year effort. But in the meantime, we're proceeding with this limited rulemaking to address large quantities of depleted uranium and other unique waste streams.

MEMBER SIEBER: So right now we're talking about depleted uranium and how it fits into the waste classifications scheme.

MR. McKENNEY: Right.

MEMBER SIEBER: On the other hand, you've got another issue out there which is mill tailings, which is a pretty large volume of material, has the same decay characteristics as DU, and so it would seem to me that that would fall into the same classification scheme.

So what are you going to do about that?

MR. McKENNEY: Well, mill tailings, one, has a law that is specifically for it, for how you do disposal of mill tailings in the United States and the standard by EPA, which is duplicated in Appendix A of Part 40.

It isn't exactly like DU. One, it's much less concentrated uranium. It also has all of the daughter products already there. Its actual source term is decreasing because you're taking away the parent radionuclides of the chain, the uranium and part of the thorium and you're process it, but you left all of the daughter products that are in it.

MEMBER BANERJEE: But all of the radium --

MEMBER RYAN: Which includes radium.

MR. McKENNEY: Right.

MEMBER SIEBER: And there is uranium in mill tailings.

MR. McKENNEY: Right, right, but only about a quarter of the original concentration is left in mill tailings. You've taken about three-quarters of it and left 100 percent of the daughter products behind.

MEMBER SIEBER: Yeah. On the other hand, when it was in the ground, it was much more dilute. So the process of milling it concentrates it in the byproduct. The waste product of milling is based on the surface, and secondly, has a significant concentration.

MEMBER CORRADINI: But I thought -- just to clarify though, it was my impression that because of the Church Rock mill tailing spill all the laws and everything you just talked about were promulgated, and so it's body burial at the least, and I think --

MEMBER RYAN: Would you help us with body burial?

MEMBER CORRADINI: Well, three meters.

MS. BUBAR: A cemetery.

MEMBER RYAN: Let's use the depth so we can be clear in the record what we're talking about.

MEMBER CORRADINI: But also the other part of it is what was between one and eight is now in the mill tailings and is decreasing with time, which was your point.

MR. McKENNEY: Right.

MEMBER CORRADINI: And much less diluted. But I think the accidents back in the '60s and '70s promulgated this law that you're speaking of.

MR. McKENNEY: Right. The UMTRCA law in 1977 which said please clean up all these sites.

MEMBER SIEBER: So are you telling me that mill tailings would still be Class A?

MR. McKENNEY: Mill tailings is not Class A unfortunately because legally it's not low level waste.

MEMBER CORRADINI: That's right. Low level waste is defined as what it is not. Low level waste is not high level waste. Low level waste is not transuranic waste. It is not mill tailings waste.

MS. BUBAR: Mill tailings has its own definition and its own piece of legislation.

MEMBER RYAN: Shame on you for reaching for one system to deal with all uranium in the same way, Jack.

MS. BUBAR: Trying to pull a logical

thread there. It's not going to happen.

MEMBER SIEBER: Yeah, that's what happens to power plant guys.

MEMBER RYAN: I share your pain.

MS. BUBAR: So that was what was in the SRM. And also the Commission directed us to do some public involvement as we were doing this. So we promptly proceeded to set up and conduct some public workshops to discuss the issues associated with DU disposal, any issues that we might consider as we're doing our rulemaking, technical parameters of concern.

We had two workshops back in the September time frame, one here and one out in Salt Lake City. We had very great attendance, and when we set them up they weren't public meeting type settings. They were workshops just like this, sitting around the table, and we tried to populate them with really smart people like Mike Ryan and others who could, you know, offer us technical advice as well as we had folks representing activists, the activist community, states, to really give us some good insight on what we should consider as we proceed with this rulemaking, limited rulemaking.

And some of the comments that we got from that which are guiding us is that there was a lot of discussion on what the folks would like to go in a rule or what they suggested to us as we consider going in a rule versus guidance. So we got very clear feedback that period of performance should be specified in the rulemaking. This gets to what we were talking about earlier because it isn't there now.

The requirement to perform and update the performance assessment should be in rules, not in guidance. And right now in Part 61, there really isn't language that says you must do a performance assessment. You can logically come to the conclusion that you must do a performance assessment, but that requirement is not clearly in the regulations.

MEMBER RYAN: Well, I would challenge anybody to apply for a license without one.

MS. BUBAR: And trust me. We've had many debates where people say that and other people say, "Yes, but you can't really find those words in the regulations." So the rule will take away any opportunity of debate.

MEMBER SIEBER: Sounds like a lawyer.

MEMBER RYAN: Sounds like a minor style point.

MR. McKENNEY: Yeah, it is. It gets into those arguments.

MS. BUBAR: Yeah, and it's becoming, you know, a big issue. So I think taking away that lack of clarity, and also we got feedback from the public that the rule should specify an intruder dose limit of 500 millirem per year.

MR. McKENNEY: That was the intruder dose limit that was assumed in EIS, was the public dose limit for like a general release would be like through groundwater or through airborne to an off-site location, is 25 millirem per year. The EIS when it established the rule in '81 had used a 500 millirem limit for the inadvertent intruder instead of the 25 millirem general public, considering, well, some could argue that that considers some level of probability in it, but it's not as great as --

VICE CHAIRMAN ARMIJO: It's not one.

MR. McKENNEY: Right. But it's a higher dose limit than the rule actually says for members of the public, is what the intruder dose value is.

MEMBER RYAN: At the risk of dragging this out a little bit further for a minute or two, there's a discontinuity in the dose calculations. The 25 millirem and the 500 millirem per year in 10 CFR 61 is calculated by a completely different method than the committed dose we use now. So that's another translation.

MR. McKENNEY: That is another public comment that we should fix.

MEMBER RYAN: And we should.

MS. BUBAR: And we got very clear feedback from the folks who gave it to us by sitting around the table or writing to us in writing that in guidance is where we should handle any details about specific exposure scenarios. Don't try to put that in the regulation.

And we also got feedback that there's no need to define a threshold for what are significant quantities. Like don't try to be so smart to say, well, X amount of depleted uranium is of concern and Y amount is not. Basically handle this through the requirement to do performance assessment, and that's where you would take into account the specific scenarios.

MEMBER CORRADINI: So I guess I had one. So you talked about time. You talked about methodology. You talked about dose. What about location? Most of these folks that are making these applications, are they under the assumption they're going to dispose in the region of where they have the manufacturing facility or it's going to start moving places?

MR. McKENNEY: Actually most of them are all assuming that we're going to use one of the commercial sites that currently exist.

MS. BUBAR: Right.

MEMBER CORRADINI: Which are already licensed.

MR. McKENNEY: Are already licensed.

MEMBER CORRADINI: And those are?

MS. BUBAR: Well, to dispose of it as Class A waste, and right now Energy Solutions in Utah can take Class A waste, and it's not subject to the compact restrictions such that, you know, if you're not in a compact state you can send it.

So I believe that is what many of these companies are presuming.

MEMBER RYAN: Correct me if I'm wrong, too, Patti, but I think there's some limited use of the U.S. Ecology site, and there's hope that there will be some use of Texas.

MS. BUBAR: The AREVA application did. They put in their application that they would presume their depleted uranium would go to the U.S. Ecology site.

MR. McKENNEY: Because they would be

required by contract, by compact requirements, because Idaho is part of the Pacific Northwest Compact. They could only ship to U.S. Ecology at Hanford.

MS. BUBAR: Right.

MR. McKENNEY: And that meanwhile WCS, of course, could handle sites that would be -- could possibly open into borders, too.

MS. BUBAR: Right. So there are disposal facilities around the country that, you know, either could take this depleted uranium now or they're banking on --

MEMBER RYAN: I think it's fair to say, Mike, and it may be helpful to your question, that there's probably a reasonably wide range of geohydrologic environments at the moment and it could get wider.

MR. McKENNEY: That are acceptable.

MEMBER CORRADINI: Assuming --

MEMBER RYAN: Well, not only sites that are licensed.

MS. BUBAR: Right.

MEMBER CORRADINI: But I guess the reason I'm asking it in this regard is assuming some end state of the period of performance and the dose that doesn't --

MR. McKENNEY: Right, right. We aren't saying that they can -- we aren't saying in this analysis, and that's why we wanted a site specific analysis, because we don't know. We have not personally licensed. All of these sites are licensed by the agreement states, and --

MEMBER RYAN: The NRC is not licensed a disposal facility since the early '60s.

MR. McKENNEY: Right, but we want all of those factors to be taken into account so they can figure out what is their inventory that they can take without causing a problem to their performance. And it may be good in some spots and it may not be as -- it may be a lot more in another one because they're site specific in some spots and it may be a lot more in another one because their site design and their performance of their local area.

MS. BUBAR: but that is the beauty of a performance assessment. That's the kind of tool that it is that allows you to look at those different scenarios and make decisions.

MEMBER RYAN: Mike, if I may also add just for your benefit and the other members, I think the team that Patti has at hand, Christopher and Chris McKenney and many others that are on the team have really some very significant performance assessment skills. They can very easily and handily do, you know, probabilistic risk informed assessments as well as deterministic calculations. They understand the GEO sciences the hydrological sciences and all the rest that I've said in, you know, Commission briefings and so forth that to my way of thinking it's the most talented performance assessment team I've seen assembled anywhere, anywhere, and so the skills are there to get it done.

MEMBER POWERS: How much did you pay him for this?

MR. McKENNEY: Twenty bucks.

MS. BUBAR: You know, we actually --

MEMBER POWERS: He's cheap.

MS. BUBAR: We thank you for those comments, and he's made totally unsolicited, really.

MEMBER POWERS: Could I talk to you guys about a different kind of payoff?

(Laughter.)

MEMBER RYAN: I don't make comments easily like that, but I really think they really have a grasp on what all of the variables are that Sam and others have brought out today.

MEMBER POWERS: Mr. Chairman, could I ask for a declaration of conflict of interest here?

(Laughter.)

MEMBER RYAN: Anyway, I know we're not going to get to the details of what they can if --

MEMBER POWERS: I'm going to need a dentist in a second this is so sweet.

MS. BUBAR: To add to what Mike is saying and what Chris is saying, we have not licensed a disposal facility. The staff that's being talked about has not licensed a disposal facility, but they've cut their teeth on what's called the waste incidental to reprocessing, which is something that we've got a legislative responsibility we've got with the Department of Energy where we do a lot of these performance assessment calculations. So they've really been able to develop a lot of tools. I mean, they're smart people.

MEMBER RYAN: Which unfortunately they did one at an arid site in South Carolina and a dry site up in Idaho. So --

MS. BUBAR: There you go.

MR. McKENNEY: Humid site in South Carolina.

MEMBER RYAN: Sorry. Humid, I'm sorry. Humid site in South Carolina.

MR. McKENNEY: It's arid down there.

MEMBER RYAN: I didn't want Dr. Powers to throw another rock at me for being nice.

MS. BUBAR: Okay. If we could go --

MEMBER RYAN: Sorry.

MS. BUBAR: -- to the next page.

Just a continuation of the comments. We also got comments that there is really no need to define the term "unique waste streams" because we got a lot of feedback that really if you're trying to prevent, you know, where we are now like we didn't anticipate large quantities of DU, we're not that smart. We're not going to be able to anticipate all of that.

MEMBER RYAN: Every waste stream that we haven't thought of before.

MS. BUBAR: Right, but no need to if you address it on a case-by-case basis through the performance assessment. So the way that was presented was don't overreach during the initial rulemaking, and we very much appreciated that advice.

So at the heart of all of this is really, you know, relying on risk informed, performance based regulation guide, and we have, you know, two guiding principles that hopefully we can continue to follow, but not only in this rulemaking, but in the longer term rulemaking because, as I mentioned, we are proceeding with this rulemaking, the limited rulemaking, and I'll talk a little bit about the path forward, but we're budgeting for this longer term rulemaking looking into redoing Part 61.

So our timetable for this limited rulemaking, as I mentioned, we have the public workshops. Chris and Chris and David Esch and other folks on the staff are developing the technical basis or we should call it the regulatory basis because it actually looks at technical and other issues.

That is to be finished September of this year, and then we will give that to our rulemakers and hopefully they will be able to develop a proposed rule within a year. So what we told the Commission in September 2011, we'd have a proposed rule and draft guidance, and September 2012 we'd have a final rule and guidance, and then, of course, we have to give that to our agreement states, and as we were mentioning, all of these facilities, the disposal facilities are regulated by agreement states, and that is generally --

MEMBER CORRADINI: All of them.

MS. BUBAR: All of them.

MEMBER CORRADINI: All the potential ones.

MS. BUBAR: All of them, absolutely.

MEMBER CORRADINI: And what is the logic or what is the process there that once the rule is promulgated you need concurrence by whom in the state?

MS. BUBAR: No. States are members of our working groups as we develop the rule.

MEMBER CORRADINI: Oh, so they're part of the stakeholders that develop the rule and comment on it. Okay.

MS. BUBAR: And then we will put a recommendation in the rule, and of course, the final rule will adopt that, as to what are the compatibility requirements of the state under the agreement state program.

MR. McKENNEY: And then they'll have up to three years to get their compatible rules in place.

MS. BUBAR: Which doesn't exactly line up with what industry is expecting. If you look at what the DOE conversion facilities that we were mentioning earlier, Portsmouth and Paducah, they actually will have large quantities of depleted uranium probably ready to be disposed if they actually start the operation in their facility this year as they're saying they will. They will have large quantities to be disposed before our rulemaking is complete.

LES and AREVA and GE Silex, the other facility, uranium enrichment facilities that we have applications for are probably on a better time schedule to have large quantities to be disposed by the time we've got our rule complete.

MEMBER CORRADINI: Thank you very much.

MS. BUBAR: Do I have other ones? No.

So let me talk just a minute about the long-term rulemaking. This will be one where we hopefully could risk inform the Part 61 with classification framework, and the Commission Director has to look at changing any conforming legislation if that's needed.

MEMBER SIEBER: Yeah, what do you mean by that?

MR. McKENNEY: That would be the low --

MS. BUBAR: It's an interesting little nuance.

MR. McKENNEY: That would like the Low Level Waste Policy Act. The Low Level Waste Policy Act actually stipulates that what class of waste is the responsibility of the state and what responsibility is of the federal government to dispose of.

Well, depending on how we change Part 61, we may or may not have classes. What happens if we don't have classes, if the recommendation comes down and you don't have classes and that you are setting up site specific waste acceptance criteria, not a general national program anymore, which is the recommendation from International is the way you should do it?

MEMBER RYAN: By the way, there's a disposal site -- Chris, just a comment there. The disposal site in France does not have concentration limits for the purpose of disposal. It's all in the site inventory determines the integrated activity, which they then use to promulgate a risk assessment.

MR. McKENNEY: Right. So the Department of Energy does it similarly. They come up with a site model, figure out what the site can actually take from an inventory standpoint in the different radionuclides and what they expect to get from their various clients from other sites and from their own site, and then they evaluate if somebody else wants to ship something. Do they look that they have actually inventory space for that within what they've already modeled?

MEMBER RYAN: Concentration determines radiation protection in transportation issues.

Inventory determines disposal risk.

MR. McKENNEY: Right. But on a system like that, if we went to that far apart, which is obviously from right now one of the options that's going to have to be on the table for the Part 61 if we are truly looking at all the options; that would be a fundamental change and would need a fundamental change in the Low Level Waste Policy Act of how would we define --

MEMBER SIEBER: Sound very complicated.

MR. McKENNEY: Oh, yes, and also there's a little part of the Low Level Waste Policy Act that says Class A, B and C as defined in 1983 is the basis for this responsibility of the states. And so if we change A, B and C, then we have to look if we have to change the legislation there, too.

MS. BUBAR: Right.

MEMBER RYAN: But ultimately if you want to head toward risk inform, having an inventory limit for a site specific case is not a bad idea.

MS. BUBAR: Right.

MR. McKENNEY: Right.

MEMBER RYAN: Sam, I think it's a lot clearer and easy to explain.

MS. BUBAR: It is, and it's more

flexible --

MEMBER RYAN: Absolutely.

MS. BUBAR: -- than what we have now.

MEMBER BLEY: So is there interaction as this is developing with some agents of Congress since you're fiddling --

MS. BUBAR: Not yet.

MR. McKENNEY: That is several years down the road because --

MEMBER BLEY: But they don't -- no representatives sitting here.

MS. BUBAR: No, but I will tell you we participate in what's called the Low Level Waste Forum, which meets twice a year, and it's just a group of, you know, anybody who really cares about low level waste in either industry or government, and there are congressional staff who come to those meetings.

MEMBER BLEY: So they kind of know what you're up to.

MS. BUBAR: Yeah, so they're kind of keeping up with it, but, no, we haven't approached, you know, any congressional staff on this.

MR. McKENNEY: Plus, the fundamental groups that were formed by the Low Level Waste Policy Act, the compacts, they all meet with the Low Level

Waste Forum and they're very interested in which way we're going to be going for this long-term rulemaking because obviously they want as little change to the Low Level Waste Policy Act was possible because they know the playground right now. The know the rules of the playground right now.

Legislative change --

MEMBER RYAN: We have about nine minutes left.

MR. McKENNEY: Okay.

MS. BUBAR: Okay. Let me just put in a little plug if any of you are going to the RIC next week. We're having a panel on this, on looking at changing of the regulatory framework for low level waste. So we've got someone from the international community to discuss how they do it in the international community; DOE. Then we'll have NRC talking about how we do it under Part 61, and then we're going to hear from industry, the nuclear industry. We're going to hear from disposal operator.

So we're trying to start the dialogue between now and 2012 to start to, you know, get people's interest whetted as we begin this.

I'm just going to briefly describe the public concerns that we did here as a result of the meeting. Shallow land burial may not be appropriate. Some folks felt that deep geologic disposal might be necessary, or salt domes. We had actually someone who participated in Utah meeting who was a salt expert, and he was very vocal about his opinions.

We had a lot of questions about the model, the screening model that we used and we discussed with you. Some folks wanted us to publicly release it. We will not be publicly releasing it, but we are going to try to have a public meeting to explain it in a little bit more detail.

And then this question of compatibility. Many folks, including states, were expressing concerns that, you know, how would this be handled. Will we have to adopt any changes? Would it be compatibility A, B or C? So we had a lot of dialogue at the public meeting on that particular question.

Slide please.

So our next steps. We got some requests to put out guidance that can be used in the interim because, as I mentioned, our rule went up to complete for 2012, and in the meantime there's just some questions and potential confusion. So we were asked to actually put our guidance. We're developing this guidance. It wouldn't have any new policy in it. It would just restate a lot of the bits and pieces that are out there in different guidance documents and now put it under one guidance document.

As I mentioned, we offered that we would explain our model. So Chris and his staff, Chris and Chris will be setting up a meeting to do that.

And then respond to any requests for technical assistance to states, and we actually do have a letter from Utah where they have asked Energy Solutions to update their performance assessment, and the State of Utah has come to us with a what we call technical assistance request to assist them with the review of that performance assessment, as well as we're doing some training of the states in a couple of weeks on the GOLDSIM model to let them, you know, get a little bit more familiar with how we've been using that.

So we definitely are prepared and are making sure that our budget is ready to support any request that we would get for technical assistance from the state.

MEMBER BANERJEE: When you said performance model, is that a deterministic model which you use --

MS. BUBAR: No.

MEMBER BANERJEE: -- or a probabilistic?

MR. McKENNEY: We use primarily a probabilistic.

MS. BUBAR: Yeah.

MR. McKENNEY: And so we can evaluate the uncertainties and sensitivities. We use alternative conceptual models we try to build into. We try to look at the things.

Of course on the generic basis it's a bit more difficult because it's a little less constrained than you do have on a site specific. When we deal with our site specific reviews and for the waste incidental reprocessing we use, again, fully probabilistic mode.

VICE CHAIRMAN ARMIJO: Is that a best estimate with uncertainties --

MR. McKENNEY: Yes, yes, yes.

VICE CHAIRMAN ARMIJO: -- that you use? Okay.

MR. McKENNEY: But, of course, it gets a little bit difficult when you --

MEMBER RYAN: If I may, and again I'm recognizing the shortness of time, I would like to request, Patti, that we think about having a follow-up meeting with your staff to maybe just demonstrate some of these calculational techniques and approaches that you use.

MEMBER BANERJEE: Well, first start with the models.

MEMBER RYAN: Yes. Start with the models and show us, you know, how you built them, how they work, what you're doing calculationally because I think there's a lot of potentially valuable feedback that you can get from the folks here that are, you know, PRA folks and other kinds of risk insights modelers that would be productive.

And I think we'd really appreciate learning more about where you're going with low level waste.

MS. BUBAR: Sure. That would be great.

MEMBER RYAN: All right. We'll put that on the agenda to maybe add to a meeting down the line.

MS. BUBAR: Were you going to ask another question?

MEMBER RYAN: Sorry, Sanjoy.

MEMBER BANERJEE: No, I was just going to ask about the models, but if you're going to have a full meeting about the model, then we can ask them --

MS. BUBAR: Yes.

MEMBER BANERJEE: -- in as much detail as we want at that point.

MS. BUBAR: Okay. Yeah, I mean, that would be fine.

MEMBER SHACK: Well, let me ask a quick question.

MS. BUBAR: Sure.

MEMBER SHACK: When you say probabilistic assessment, do you really mean an uncertainty analysis expressed in probabilistic terms or a PRA type analysis where you're looking at scenarios and likelihoods of events?

MEMBER RYAN: Or both.

MEMBER SHACK: Or both.

MR. McKENNEY: We're looking at more of both because of the fact that, one, you have on the intruder side, you have assumed scenarios, and you evaluate that along with maybe the uncertainty and sensitivity, uncertainty associated with the processes, the environmental processes that are occurring, you know, diffusion rates, transport rates, time people are exposed, that sort of stuff.

On the other side we look at which is we try to factor in probability of events and other things to do much more of a flowing time.

MEMBER CORRADINI: So, I mean, you do a

series of simulation realizations. I mean, it's no different -- I mean, put it differently, it's no different than what they've done for Yucca Mountain, except that you have defined scenarios. Where they had volcanic, they'd have intrusion, and then you'd have a series of realizations that has what I think you're looking for, is the uncertainties of input conditions.

MR. McKENNEY: Right.

MS. BUBAR: Do you want to talk about the GOLDSIM model?

MEMBER RYAN: I guess I would just ask we're going to run against time.

MS. BUBAR: Okay. Sorry. I'd like to ask if there are any questions, but I sure feel like we have had questions.

MEMBER POWERS: Well, on this uncertainty analysis, you said you're like Yucca Mountain. Does that mean that you do Latin hypercube samples?

MR. McKENNEY: Oh, yes.

MEMBER POWERS: So you automatically guarantee that your variances are very low relative to the true variances.

MR. McKENNEY: We're talking data.

MEMBER POWERS: Well, Latin hypercube is a variance narrowing technology.

MR. McKENNEY: Right.

MEMBER POWERS: It will not simulate the true variance. It is absolute guaranteed not to converge to the true variance. If you're not interested in the variance. You're only interested in the mean, that's fine. But if you are interested in the variance, and I assume that you would be, you're getting an under bound on the mean.

The mean is probably fine, but your variance is going to be low.

MEMBER CORRADINI: By an unknown amount.

MEMBER POWERS: By an unknown amount.

MEMBER CORRADINI: So there is no solution to that, right?

MEMBER POWERS: Yes, there is. Straightforward Monte Carlo is guaranteed to converge to the true variance.

MEMBER CORRADINI: But I thought the TPAs for -- this is off topic, Bill -- but I thought the TPAs did both for Yucca Mountain. They did a series of realizations that --

MEMBER POWERS: Don't know what they did for Yucca Mountain. I'm just asking these folks, and if they're doing Latin hypercube sampling, they are not getting the true variance.

MEMBER SIEBER: We can probably do that off line.

MR. McKENNEY: Yeah. Well, we can definitely get into that at the model discussion.

MS. BUBAR: Yeah.MEMBER RYAN: I think there's a number of these questions that would be fruitful material for a future briefing of the Committee.

MEMBER SIEBER: I'd like to ask a question that somebody in private can tell me the answer, and I'm still concerned about the concept of waste form and what difference it makes.

MR. McKENNEY: Yes.

MEMBER SIEBER: You know, is that something I ought to be thinking about because it offers an advantage or I shouldn't be thinking about because the staff doesn't want to consider it? Or technically it's the scripted concept?

MR. McKENNEY: Well, I think that most of the staff is actually very interested in actually how we do it,b ut the concept is whether at this point if we require site specific analyses, is it our position to try to generate what is the best waste form or is that -- since waste form along with design and site conditions is a number of free variables, would that be the best waste form for a site would be a question of a site specific analysis.

MEMBER SIEBER: It would be different depending on the site.

MS. BUBAR: Right, right.

MEMBER SIEBER: Okay. All I'm saying is I need to learn more about that because I'm curious now, and that would help me.

MS. BUBAR: Okay.

MEMBER RYAN: Thank you.

Mr. Chairman, we're at the end of our session.

CHAIRMAN ABDEL-KHALIK: Well, thank you. Perfect timing.

VICE CHAIRMAN ARMIJO: A good session.

CHAIRMAN ABDEL-KHALIK: Thank you very much for your presentation.

MS. BUBAR: Thank you.

CHAIRMAN ABDEL-KHALIK: At this time we'll take a break till 3:30. The next session -- I guess this is the end of our transcription. So the next session will be off the record.

(Whereupon, the foregoing matter went off the record at 3:14 p.m. and went back on the record at 3:15 p.m.)

MEMBER RYAN: Is there anybody on the bridge line, please?

(No response.)

MEMBER RYAN: Is there anybody there who would like to make a comment or observation?

(No response.)

MEMBER RYAN: Hearing no response, and knowing the bridge line is open, then we're done.

MS. BUBAR: Okay. Thank you.

(Whereupon, at 3:15 p.m., the meeting was concluded.)

Digital I&C Systems in Safety Applications at Fuel Cycle Facilities

Advisory Committee on Reactor Safeguards
March 4, 2010

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Agenda

- Background
- Regulatory Basis
- Review Topics of DI&C-ISG-07
- Public/ACRS Comments Incorporated
- Status/Next Steps

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Interim Staff Guidance (ISG) DI&C-ISG-07 on Fuel Cycle Facilities

- Purpose
  - To establish guidance for the consistent review of the availability and reliability of safety-related digital I&C applications in fuel cycle facilities

- Applicability
  - License applications for new facilities; amendments and renewals to facilities for which the digital I&C systems have not been previously reviewed by NRC

Regulatory Background

- Standard Review Plan NUREG-1520 does not contain specific references to design criteria within industry codes and standards for I&C
- 10 CFR Part 70 does not contain I&C or controls design criteria analogous to that of 10 CFR Part 50, Appendix A

Regulatory Background (continued)

- TWG-7 was formed in response to Industry and NRC concerns regarding the need for consistency of review of fuel cycle facility applications

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Fuel Facility Risk vs. Reactor Risk

- Fuel facility radiological risk generally lower than that of power reactors
  - Worker radiation exposure low but still possible
  - Potential for criticality accidents poses risk to facility workers
  - Generally low offsite risks
- Differences in emergency shutdown I&C designs:
  - Fuel Cycle Facilities
    - For most applications, active engineered controls stop the process immediately – prevention vs. mitigation--facility placed in a safe condition
  - Light Water Reactors
    - Decay heat removal continues
    - Multiple redundant channels—1oo2 twice, 2oo3, etc
    - Inter-channel logic comparisons (newer designs)
    - Significantly higher consequences of accident sequences

Regulatory Basis of DI&C-ISG-07

- 10 CFR Part 70 Safety Program
  - Conduct an Integrated Safety Analysis (ISA)
  - Identify each Facility Hazard and the Likelihood and Consequence of accident sequences
  - Facility Performance Requirements
  - Items Relied on for Safety (IROFS)
  - Management Measures

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Items Relied on for Safety (IROFS)

- IROFS are structures, systems, equipment, components, and activities of personnel relied on to prevent potential accidents at a facility that could exceed the performance requirements in 70.61 or to mitigate their potential consequences.
- IROFS or Systems of IROFS may consist of:
  - Active Engineered Controls
  - Passive Engineered Controls
  - Administrative Controls
  - Combinations of the above

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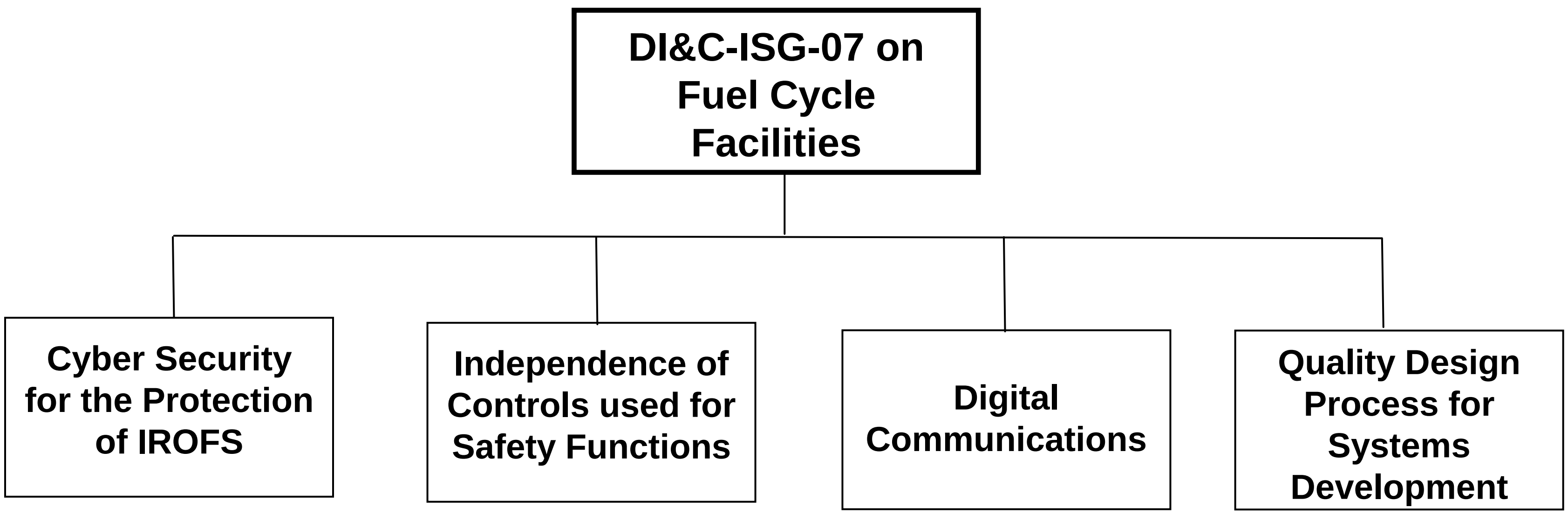
Review Topics DI&C-ISG-07



Cyber Security

- No current NRC policy or rulemaking exists regarding cyber security for fuel cycle facilities
- ISG defines cyber events – challenges to functions of digital IROFS—either deliberate or inadvertent
- ISG identifies good practices which may be programmatically applied to ensure the reliability and availability of digital IROFS. Goal: to protect safety functions from the effects of cyber events

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Cyber Security (continued)

- The ISG provides review guidance in the form of acceptable high-level management measures describing performance goals, elements, and characteristics

- ISG identifies examples of critical tasks performed in fuel cycle facilities by digital systems that could benefit from the establishment of good cyber security practices

- Describes acceptable management measures and good practices which may be applied programmatically

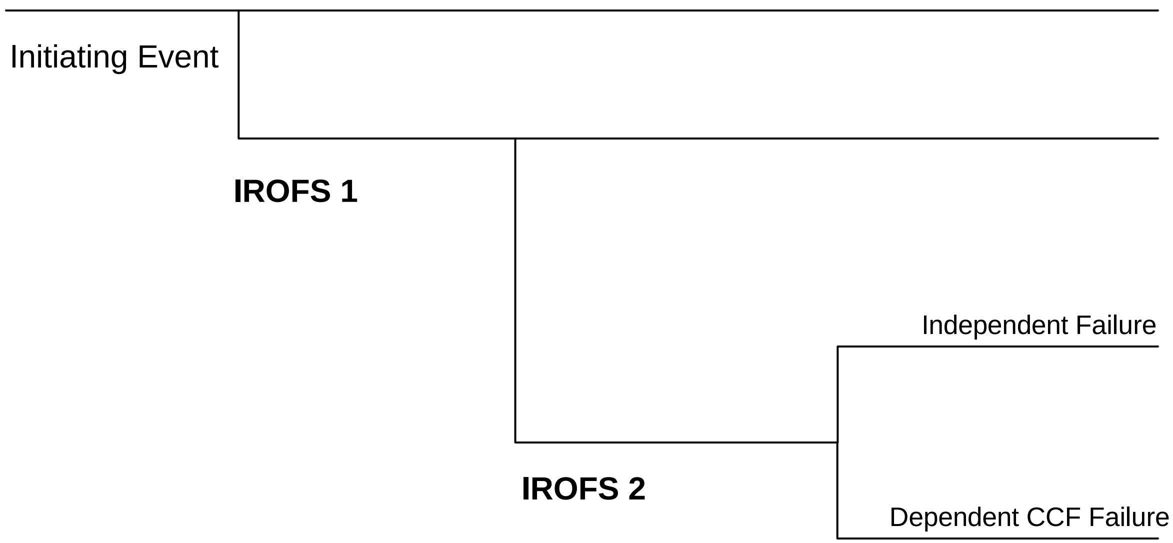
Independence of IROFS

- The ISA identifies events and potential accident sequences to be prevented or mitigated through the application of one or more IROFS

- The likelihood of potential Common Cause Failure (CCF) contributions between two or more IROFS designed to prevent or mitigate a specific event should be minimized

Independence of IROFS (continued)

Simplified Event Tree



Comments

No risk reduction

(unmitigated)

Risk reduction -
One IROFS

Risk reduction -
Two IROFS

Risk reduction –

Two IROFS + CCFs*

*Note: CCFs contribute at most 1% additional risk

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Independence of IROFS (continued)

- Acceptance criteria for the likelihood of occurrence of potential Common Cause Failure (CCFs) contributions:
  - The combined likelihood of all potential CCFs must be significantly less than the likelihood of combined failures of all IROFS considered independently.
  - “Significantly less” means at least 2 orders of magnitude smaller than the estimate of independent failures for a system of IROFS. (No more than an additional 1% risk contribution.)

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Independence of IROFS (continued)

- The ISG provides practical examples of acceptable designs for digital IROFS considered to be independent

- The ISG also provides guidance for the acceptance of other coping mechanisms for achieving independence when mathematical independence cannot be demonstrated

- The ISG also provides a discussion of acceptable ways of resolving software common cause failure contributions to risk (--use of diversity or 100% testability)

Digital Communications

- Goal is to provide assurance that IROFS are protected against potential digital communications errors

- Guidance is based on DI&C-ISG-04, ISG on Highly Integrated Control Rooms – Communications Issues

Digital Communications (continued)

- Digital Communication Management Measures
  - Protection from Communication Faults
  - Isolation between Safety and Non-Safety
  - Prevention of On-Line Changes to Software
  - Protection of the Integrity of Communications between Field Controllers and Human Machine Interfaces

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High Quality Systems Development Process

- Goal is to have reasonable assurance that digital I&C safety systems are designed in a manner that minimizes the likelihood of common cause software failures

- Guidance is provided regarding acceptable graded management measures
  – Guidance addresses acceptable systems development processes for achieving high quality software, and methods for evaluating systems proposed for use in accomplishing safety functions

High Quality Systems Development (continued)

- The graded approach steps considered in the ISG include a range of quality processes:
  - 10 CFR 50 Appendix B software quality life cycle processes developed for use in commercial power reactors
  - Commercial grade dedication processes for Commercial off-the-shelf (COTS) systems
  - IEC 61508/ISA S84.00.01 and IEC 61511 (SIL Levels)
  - Alternative means, including third-party certification processes, for acceptably low-risk applications

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

High Quality Systems Development (continued)

- Management Measures should be implemented to address:
  - Software Requirements Specifications
  - Software Design
  - System Integration/Installation and Testing
  - Operations and Maintenance

ISG Development Process Used

- Task Working Group 7 had a high level of interaction with stakeholders (NEI and Fuel Manufacturers)
  - 18 Category 2 public meetings held
  - 2 Site visits with licensee engineering staff
- ISG Issued for Public Comments
  - Category 2 Public Meeting held to disposition comments
- ACRS Subcommittee presentation

Public Comments Addressed

- General comment throughout ISG: Clarify that the management measures identified may be applied in a graded manner, commensurate with the level of risk reduction required for the IROFS
- Specific comments regarding:
  - Cyber Security
  - Independence
  - Communications
  - High Quality Systems Development

ACRS Subcommittee Comments

- Cyber Security:
  - Refine definition of cyber event: Include both deliberate and unintended events. Exclude bona fide software design errors.
- Communications:
  - Clarify applicability of criteria: Focus on architecture typically found in fuel cycle facilities.

ACRS Subcommittee Comments (continued)

- High Quality Development Processes
  - Address adequacy of operating history on which to base conclusions regarding reliability
  - Include criteria regarding precautions for use of third-party certification processes

Status/Next Steps

- Public comments incorporated as appropriate and ACRS Subcommittee comments addressed.
- Next step: Digital I&C Steering Committee concurrence/Issue ISG for use
- Ultimate goal: Incorporate DI&C-ISG-07 guidance into the fuel cycle licensing standard review plan, NUREG-1520

Regulatory Guide 1.141
Revision 1

Containment Isolation Provisions For Fluid Systems

Briefing Objectives

- Identify pertinent:
  - Regulatory requirements
  - Industry guidance
  - Additional NRC guidance
- Provide a summary of the changes made from the initial issue of RG 1.141 to Revision 1.

Regulatory Requirements

- 10 CFR 50 Appendix A, GDC 54, 55, 56, & 57 requires licensees to provide isolation capabilities to piping systems that penetrate the primary containment to reflect the importance to safety of isolating these piping systems

Regulatory Requirements

- *Criterion 54--Piping systems penetrating containment*. Piping systems penetrating primary reactor containment shall be provided with leak detection, isolation, and containment capabilities having redundancy, reliability, and performance capabilities which reflect the importance to safety of isolating these piping systems. Such piping systems shall be designed with a capability to test periodically the operability of the isolation valves and associated apparatus and to determine if valve leakage is within acceptable limits.

Regulatory Requirements

- *Criterion 55--Reactor coolant pressure boundary penetrating containment*. Each line that is part of the reactor coolant pressure boundary and that penetrates primary reactor containment shall be provided with containment isolation valves as follows, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis:
  - (1) One locked closed isolation valve inside and one locked closed isolation valve outside containment; or

Regulatory Requirements

- *Criterion 55 (cont'd)*
  - (2) One automatic isolation valve inside and one locked closed isolation valve outside containment; or
  - (3) One locked closed isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment; or
  - (4) One automatic isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

Regulatory Requirements

- *Criterion 55 (cont'd)*

  Isolation valves outside containment shall be located as close to containment as practical and upon loss of actuating power, automatic isolation valves shall be designed to take the position that provides greater safety.

  Other appropriate requirements to minimize the probability or consequences of an accidental rupture of these lines or of lines connected to them shall be provided as necessary to assure adequate safety. Determination of the appropriateness of these requirements, such as higher quality in design, fabrication, and testing, additional provisions for inservice inspection, protection against more severe natural phenomena, and additional isolation valves and containment, shall include consideration of the population density, use characteristics, and physical characteristics of the site environs.

Regulatory Requirements

- *Criterion 56--Primary containment isolation*. Each line that connects directly to the containment atmosphere and penetrates primary reactor containment shall be provided with containment isolation valves as follows, unless it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis:

  (1) One locked closed isolation valve inside and one locked closed isolation valve outside containment; or

  (2) One automatic isolation valve inside and one locked closed isolation valve outside containment; or

Regulatory Requirements

- *Criterion 56 (cont'd)*
  - (3) One locked closed isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment; or
  - (4) One automatic isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

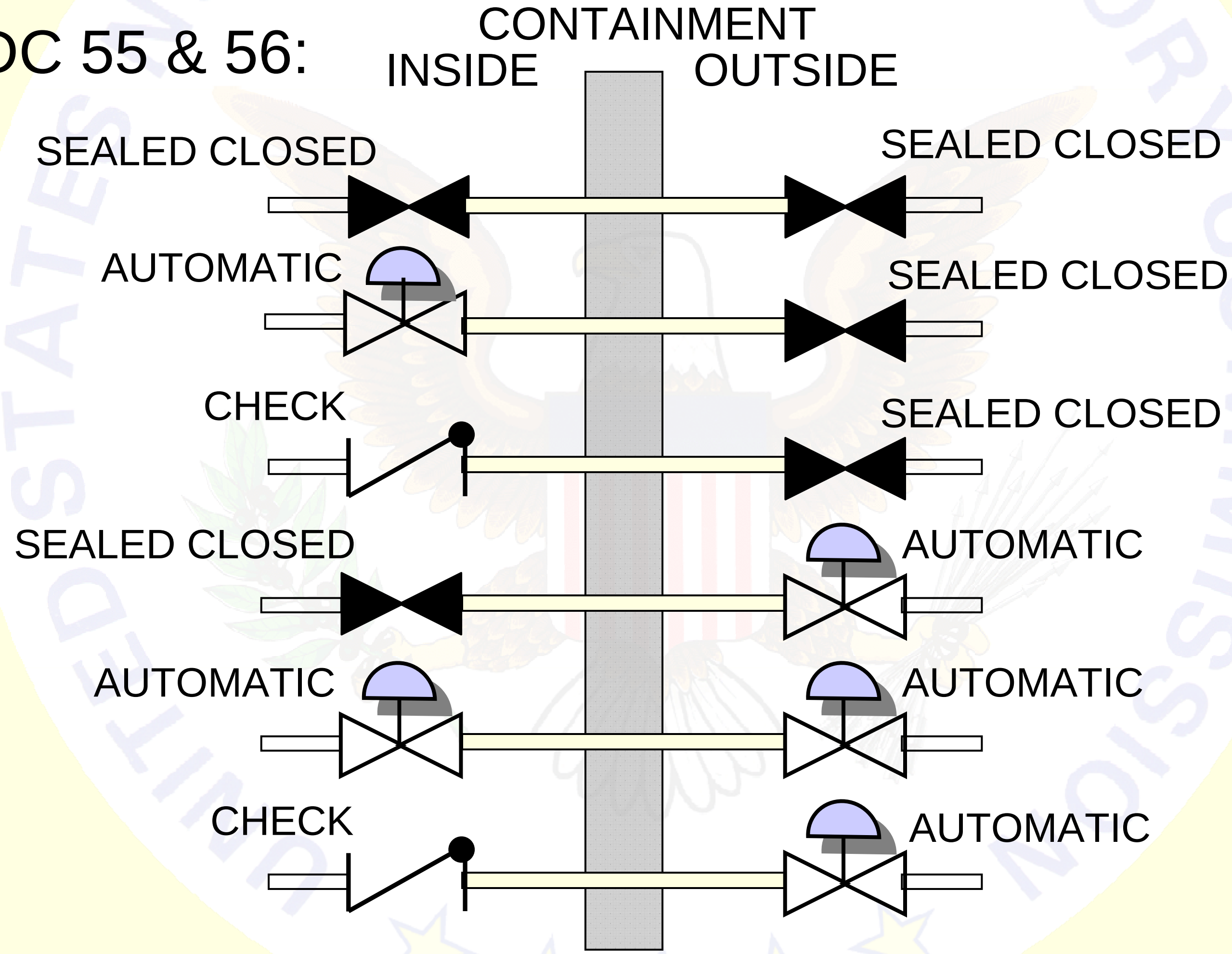
  Isolation valves outside containment shall be located as close to the containment as practical and upon loss of actuating power, automatic isolation valves shall be designed to take the position that provides greater safety.

Regulatory Requirements

- *Criterion 57--Closed system isolation valves*. Each line that penetrates primary reactor containment and is neither part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere shall have at least one containment isolation valve which shall be either automatic, or locked closed, or capable of remote manual operation. This valve shall be outside containment and located as close to the containment as practical. A simple check valve may not be used as the automatic isolation valve.

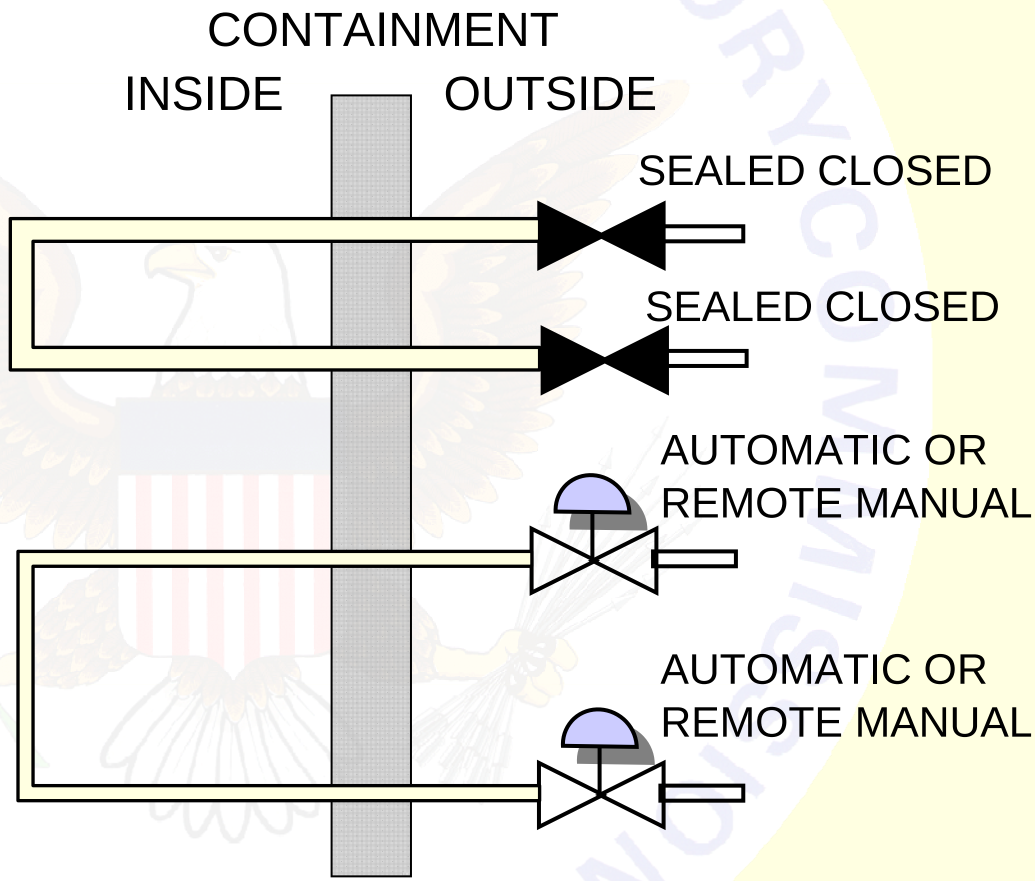
Regulatory Requirements

GDC 55 & 56:



Regulatory Requirements

GDC 57:



Industry Guidance

- The American Nuclear Society (ANS) Standards Committee ANS-50, Nuclear Power Plant Systems Engineering, formed a Working Group (ANS-56.2) which in April, 1973 initiated preparation of an industry standard to cover in one document the requirements for containment isolation provisions for fluid systems. The American National Standards Institute, Inc. approved that standard June 28, 1976 as N271-1976, Containment Isolation Provisions for Fluid Systems.

Industry Guidance

- Reg Guide 1.141, April 1978 (original issue) endorsed N271-1976 as being generally acceptable subject to 6 regulatory positions.

- The ANS-56.2 working group responsible for ANS N271-1976 disbanded in the mid-1980’s.

Additional NRC Guidance

- The Three Mile Island accident occurred in March 1979.
- NUREG-0737, Clarification of TMI Action Plan Requirements, was published in November, 1980. Clarification Item II.E.4.2, Containment Isolation Dependability, identified recommended positions on containment isolation system designs. These were incorporated into 10 CFR 50.34(f)(2) and Section 6.2.4, Containment Isolation System, of the July, 1981, reissue of the Standard Review Plan as NUREG-0800.

Additional NRC Guidance

- NUREG-0800, Standard Review Plan, Section 6.2.4, Containment Isolation System, Revision 3 was issued in March, 2007.

Regulatory Guide 1.141, Revision 1

- The substance and regulatory positions identified are essentially intact from the existing (original issue) version of RG 1.141.
- Includes improved regulatory guidance as a result of the NRC staff's review of the lessons learned from the accident at Three Mile Island Nuclear Generating Station, Unit 2
- Provides updated NRC guidance on acceptable design, testing, and maintenance requirements that licensees may use to comply with GDC 54, 55, 56, & 57 of Appendix A to 10 CFR Part 50 for the isolation of fluid systems that penetrate the primary containment of light-water-cooled reactors.

Regulatory Guide 1.141, Revision 1

- Similar to the original issued in April, 1978, RG 1.141, Revision 1 endorses the provisions of industry standard ANSI N271-1976, “Containment Isolation Provisions for Fluid Systems” subject to certain regulatory positions.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 1 (Carry-over from original Reg Guide issue.):

  Section 3.6.4 of ANSI N271-1976 states, "The closed system shall be leak tested in accordance with 5.3 of this standard unless it can be shown by inspection that system integrity is being maintained for those systems operating at a pressure equal to or above the containment design pressure." The system integrity inspections may be applied to closed systems inside the containment in lieu of leak testing.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (Brought in from SRP 6.2.4. It modifies provision of N271-1976 by restricting relief valves used as containment isolation valves to having a set point of at least 1.5 times containment design pressure.):

Section 3.6.6 of ANSI N271-1976 states "Relief valves in the backflow direction may be employed as isolation valves provided they satisfy the requirements of this standard." The licensee may use relief valves in the backflow direction or the forward (relief) flow direction as isolation valves

Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):

  provided that the relief set-point is greater than 1.5 times the containment design pressure in a manner consistent with NRC SRP 6.2.4, Subsection SRP Acceptance Criteria Item #7.

Review of historical documents shows the limitation to "greater than 1.5 times the containment design pressure" appeared in the May 1980 LWR Edition of NUREG-75/087, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. A former NRC employee familiar with review

Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):

  of containment isolation provisions at that time indicated a general recollection that the "1.5 times" restriction was being used as early as 1978. No documented basis for exactly when or how the "1.5 times" was arrived at was found. Most systems penetrating containment were designed for 125 psig or greater and with most containment design pressures 75 psig or less, a relief valve setpoint of at least 1.5 times containment design pressure should be readily achievable to allow proper pressure

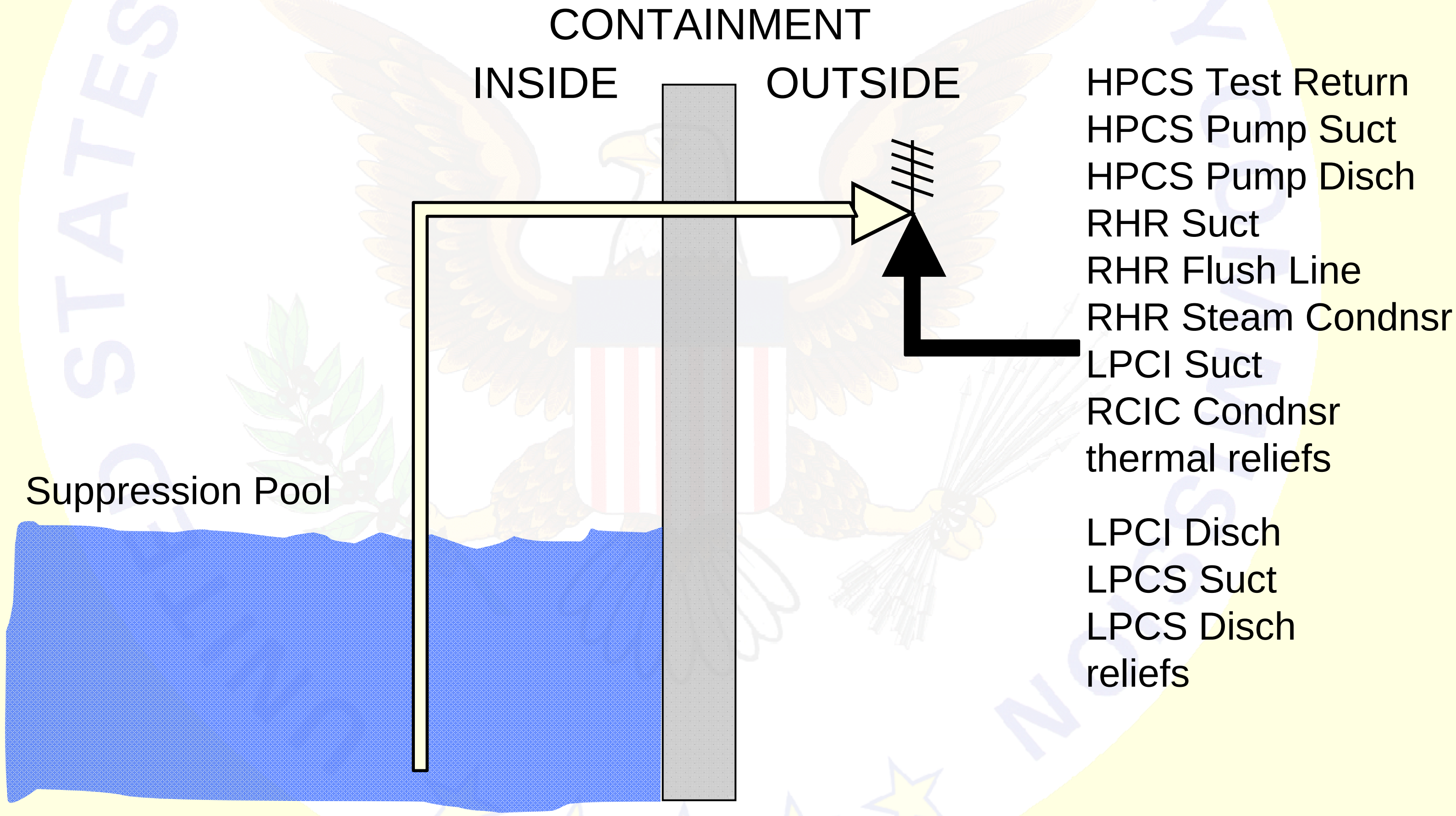
Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):

  protection of the affected systems (while avoiding gross pressure over-design) and a reasonable margin for setpoint drift to ensure post-accident containment integrity.

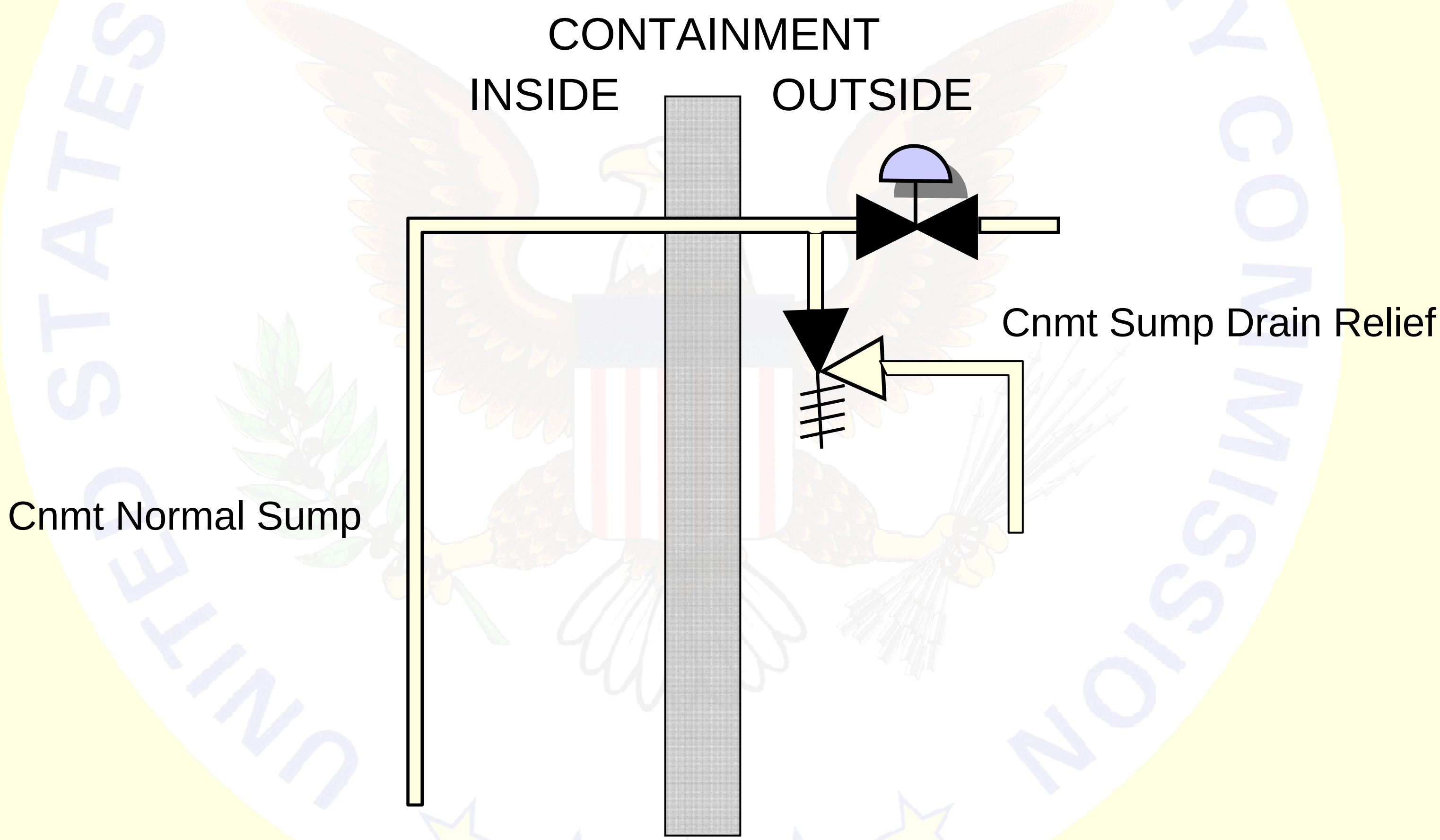
Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):



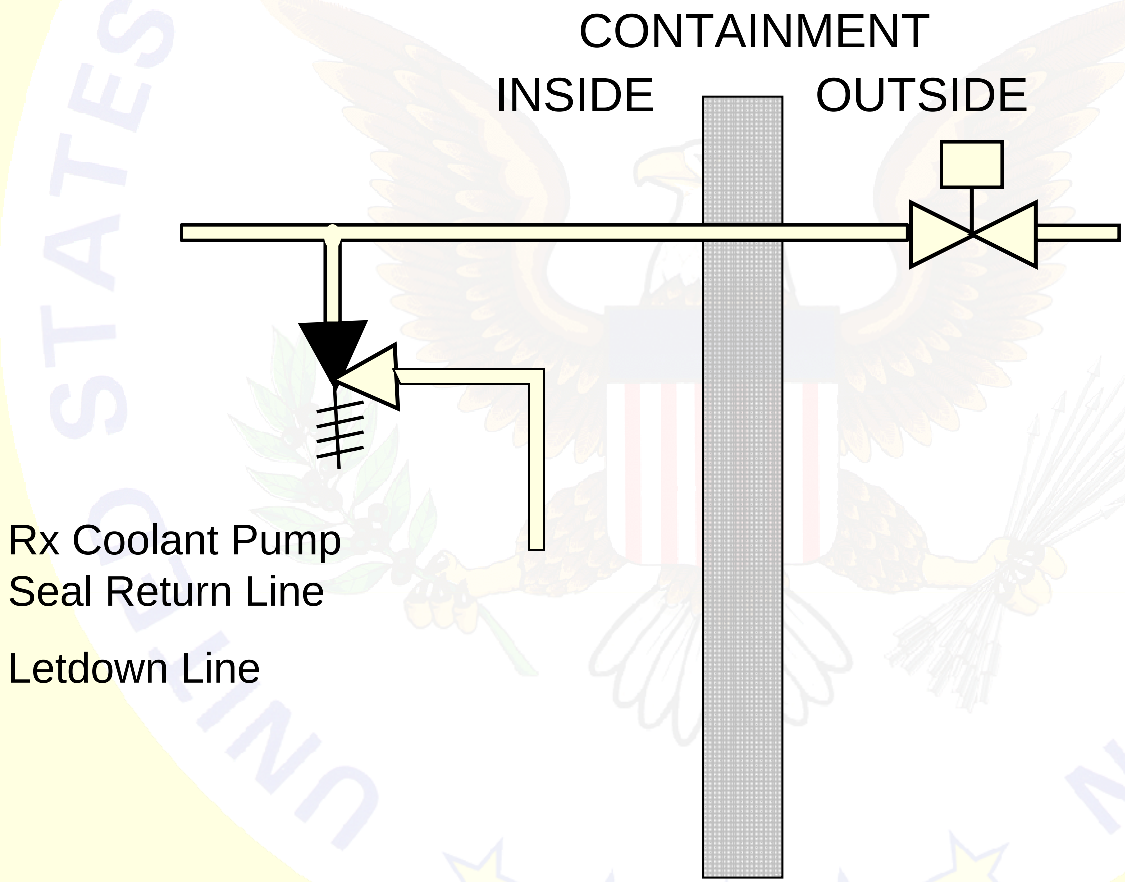
Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):



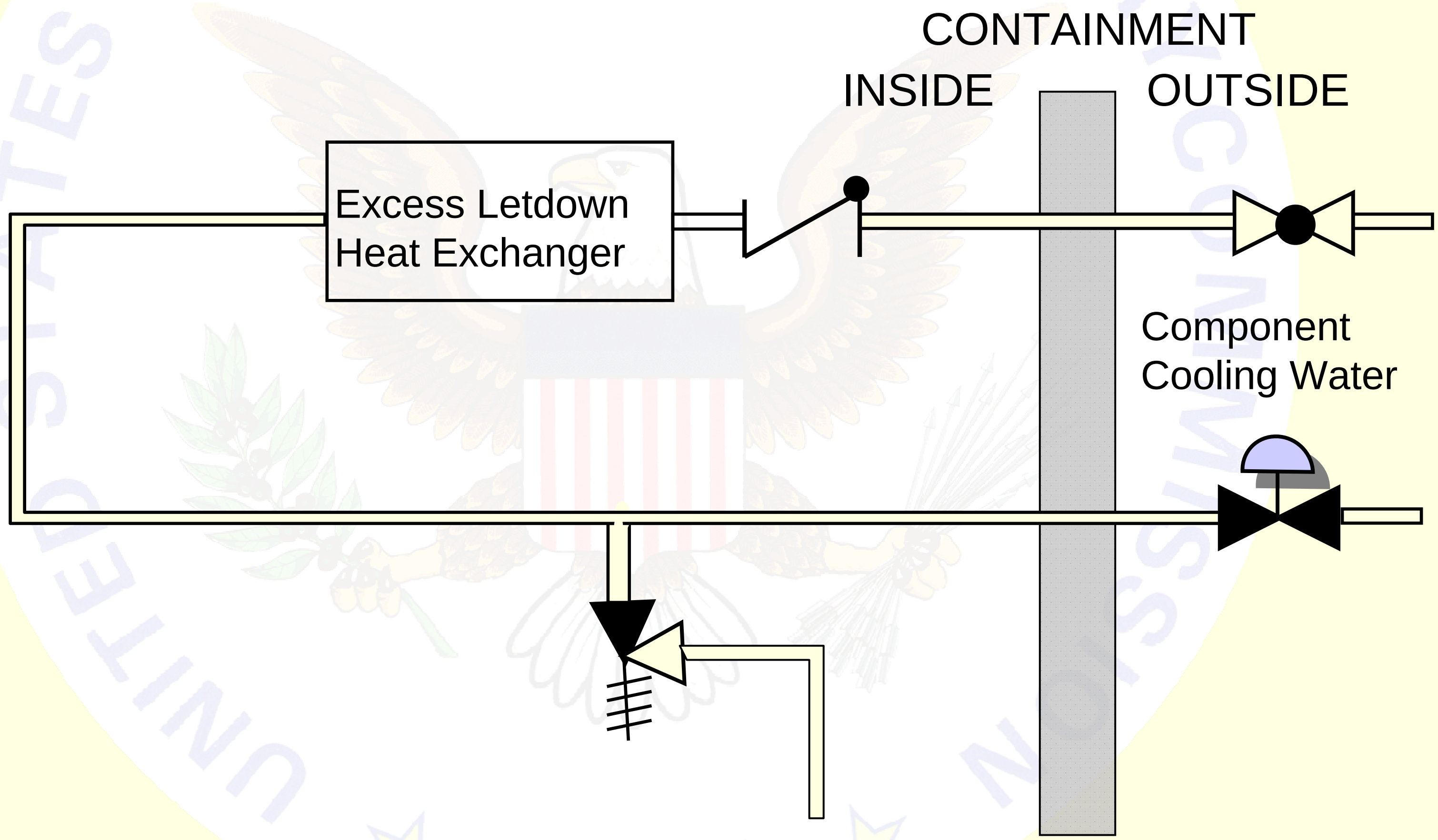
Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):



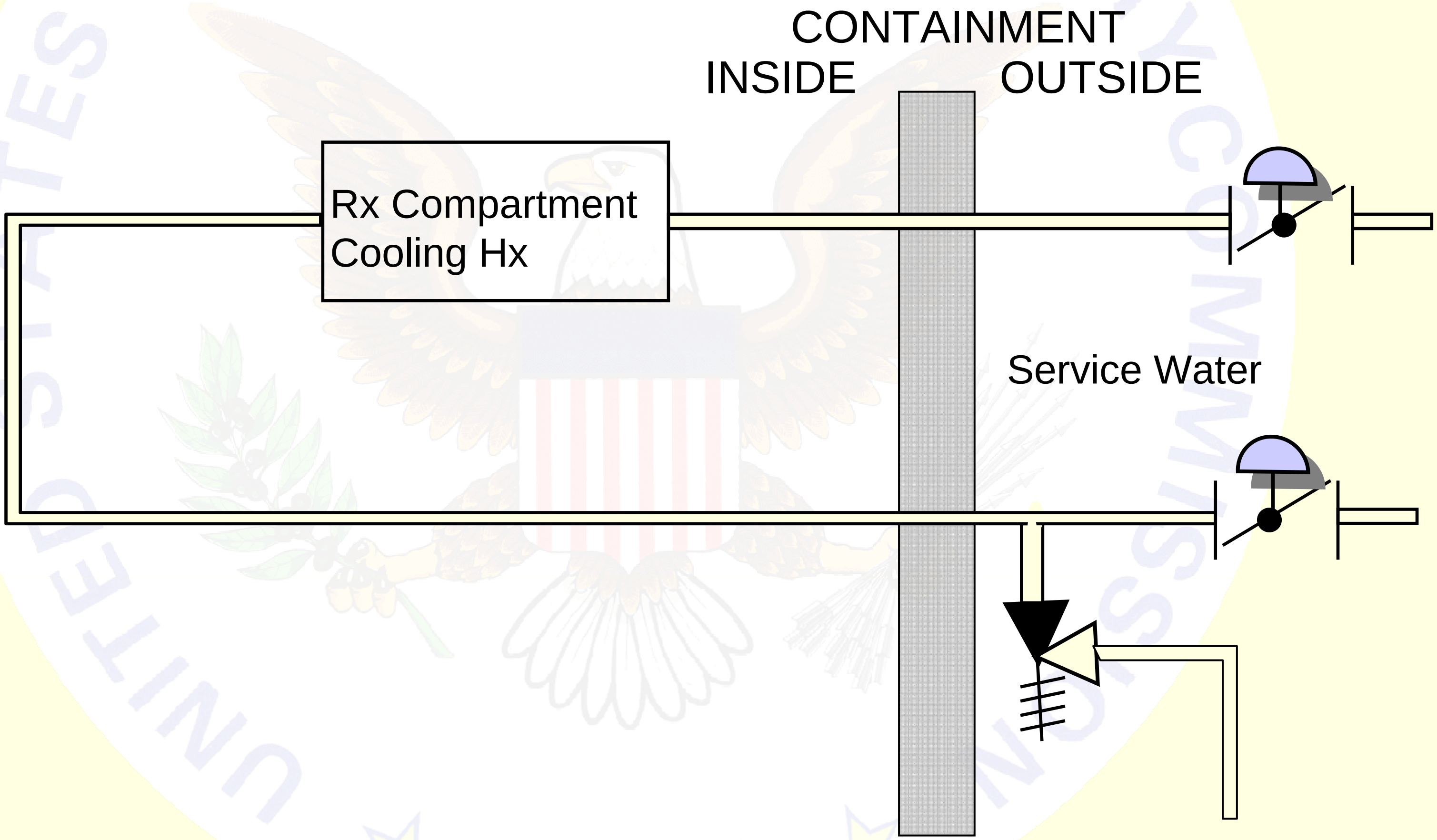
Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):



Regulatory Guide 1.141, Revision 1

- Regulatory Position 2 (cont'd):



Regulatory Guide 1.141, Revision 1

- Regulatory Position 3 (Brought in from Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions." Provision for accident related thermally induced overpressure protection for containment penetration piping if that pressure would exceed the design pressure of the containment barriers and piping.):

  The licensee should provide thermally induced overpressure protection for liquid-filled piping between containment isolation barriers inside containment to prevent damage when the piping is isolated unless

Regulatory Guide 1.141, Revision 1

- Regulatory Position 3 (cont'd)

  the licensee can demonstrate that the pressure between the isolation barriers cannot exceed the design pressure of the isolation barriers or the design pressure of the piping. Any thermally induced overpressure protection method that the licensee uses should provide such protection inside containment at the maximum back-pressure condition that could exist during a loss-of-coolant accident.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 4 (Carry-over from original Reg Guide issue.):

Section 4.2.3 of ANSI N271-1976 states, “Sealed closed isolation valves are under administrative controls and do not require position indication in the control room for valve status.” Because the containment isolation valves are components of the containment isolation system, which is an engineered safety feature system, all power-operated valves should have position indication in the control room.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 5 (Brought in from SRP Section 6.2.4.):

  Section 4.2.4 of ANSI N271-1976, "Isolation valve closure shall be completed when an isolation signal is received, and the valve shall not be opened until the signal is removed and deliberate operator action is taken (reset switch)." The reactor operator should not be able to override a containment isolation signal in such a way that would return any isolation valve to its normal (pre-accident) condition by a single action. More specifically, neither the reset/override of the safety injection actuation signal nor the reset/override of a containment isolation

Regulatory Guide 1.141, Revision 1

- Regulatory Position 5 (cont'd)

  actuation signal for a group of valves should cause the reopening of any isolation valve. The licensee should not consider the use of procedural controls to prevent the reopening of a valve upon reset/override as an acceptable design alternative. The design of the reset/override capability should require a deliberate separate operator action, in addition to the reset/override of the signal, reopening of each containment isolation valve. Reg Guide 1.33, "Quality Assurance Program Requirements (Operation)," provides additional guidance on procedures.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 6 (Carry-over from original Reg Guide issue with expanded detail.):

Section 4.2.5 of ANSI N271-1976 states, "Diversity in means of actuation of automatic isolation valves in series should be considered to preclude common mode failure." The NRC staff's position is that the licensee should provide diversity in the parameters sensed (i.e., types of isolation signals) for the initiation of containment isolation. The licensee may design the containment isolation logic to automatically initiate containment isolation upon the

Regulatory Guide 1.141, Revision 1

- Regulatory Position 6 (cont'd):

  occurrence of an isolation signal derived from the individual coincidence logic of any of the continuously monitored parameters, such as those given in Section A.2 of Appendix A to ANSI N271-1976 for boiling-water reactors or in Section B.2 of Appendix B to ANSI N271-1976 for pressurized-water reactors. As a minimum, the licensee should monitor the following parameters, each with the capability of initiating containment isolation:

Regulatory Guide 1.141, Revision 1

- Regulatory Position 6 (cont'd):
  - *a. high containment pressure;*
  - *b. high radiation level within containment; and*
  - *c. any manual, automatic, or coincident actuation of an engineered safety feature system or subsystem.*

Regulatory Guide 1.141, Revision 1

- Regulatory Position 7 (Brought in from SRP Section 6.2.4. Added stipulation that a containment isolation signal should automatically isolate all nonessential systems.):

  Section 4.4.2 of ANSI N271-1976 states, "For power-operated isolation valves, which do not receive a containment isolation signal, the primary mode shall be a remote manual initiation signal from the main control room." However, a containment isolation signal should automatically isolate all nonessential systems, as required in 10 CFR 50.34(f)(2)(xiv).

Regulatory Guide 1.141, Revision 1

- Regulatory Position 8 (Carry-over from original Reg Guide issue.):

Section 4.4.8 of ANSI N271-1976 gives general design requirements for closed systems. In addition, all branch lines and their isolation valves in closed systems both inside and outside the containment should meet the design criteria of Section 3.5 or Section 3.6.7 of ANSI N271-1976 if the branch line constitute one of the containment isolation barriers.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 9 (Carry-over from original Reg Guide issue with expanded detail.):

  Section 4.6.3 of ANSI N271-1976 cites Reg Guide 1.7, "Control of Combustible Gas Concentrations in Containment following a Loss-of-Coolant Accident", for guidance in determining radiation exposures for a loss-of-coolant accident. Reg Guide 1.89, "Qualification of Class 1E Equipment for Nuclear Power Plants", gives more appropriate guidance to determine radiation exposures for a loss-of-coolant accident.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 9 (cont'd)

  For plants that have amended their licensing basis to use an alternative source term, see Appendix I of Reg Guide 1.183.

Regulatory Guide 1.141, Revision 1

- Regulatory Position 10 (Carry-over from original Reg Guide issue.):

Section 4.14 of ANSI N271-1976 states, "The piping between isolation barriers or piping, which forms part of isolation barriers, shall meet the requirements of 3.7 and applicable requirements for isolation barriers." Piping between isolation barriers should meet the applicable requirements of Section 3.5 or Section 3.7 of ANSI N271-1976.

Regulatory Guide 1.141, Revision 1

- No public comments received.
- No reduction in or lessoning of regulatory positions.
- No back-fit intended in connection with issuance of Revision 1.

Proposed Revision 2 to RG 4.11
Terrestrial Environmental Studies for Nuclear Power Stations

J. Peyton Doub, PWS, CEP

Environmental Scientist (Terrestrial Ecologist)

NRO-DSER-RENV

March 4, 2010 Presentation to ACRS

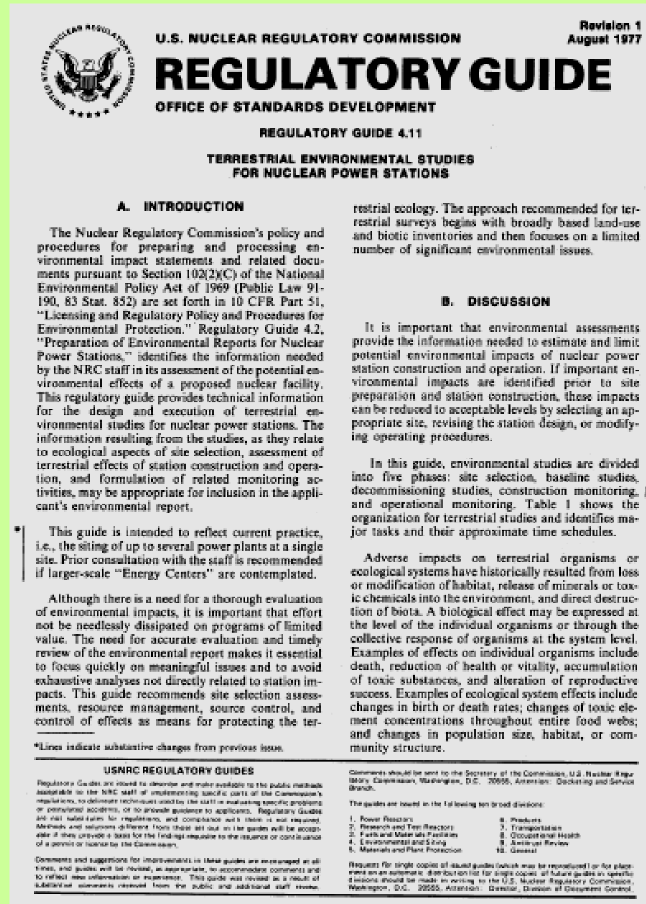
Regulatory Guides

From NRC Website:

The Regulatory Guide series provides guidance to licensees and applicants on implementing specific parts of the NRC's regulations, techniques used by the NRC staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits or licenses.

Regulatory Guide 4.11 History

- First published: July 1976
- Revision 1 (latest): August 1977
- Addresses terrestrial ecological studies over life cycle of nuclear power plants
- Does not address aquatic ecological studies
- Proposed Revision 2: Internally drafted in 2009 as Draft Guide (DG) 4016.
- Presentation to ACRS Radiation Protection and Nuclear Safety Subcommittee December 16, 2009



U.S. NUCLEAR REGULATORY COMMISSION

Revision 1
August 1977

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 4.11

TERRESTRIAL ENVIRONMENTAL STUDIES
FOR NUCLEAR POWER STATIONS

A. INTRODUCTION

The Nuclear Regulatory Commission's policy and procedures for preparing and processing environmental impact statements and related documents pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (Public Law 91-190, 83 Stat. 852) are set forth in 10 CFR Part 51, "Licensing and Regulatory Policy and Procedures for Environmental Protection." Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Stations," identifies the information needed by the NRC staff in its assessment of the potential environmental effects of a proposed nuclear facility. This regulatory guide provides technical information for the design and execution of terrestrial environmental studies for nuclear power stations. The information resulting from the studies, as they relate to ecological aspects of site selection, assessment of terrestrial effects of station construction and operation, and formulation of related monitoring activities, may be appropriate for inclusion in the applicant's environmental report.

* This guide is intended to reflect current practice, i.e., the siting of up to several power plants at a single site. Prior consultation with the staff is recommended if larger-scale "Energy Centers" are contemplated.

Although there is a need for a thorough evaluation of environmental impacts, it is important that effort not be needlessly dissipated on programs of limited value. The need for accurate evaluation and timely review of the environmental report makes it essential to focus quickly on meaningful issues and to avoid exhaustive analyses not directly related to station impacts. This guide recommends site selection assessments, resource management, source control, and control of effects as means for protecting the terrestrial ecology. The approach recommended for terrestrial surveys begins with broadly based land-use and biotic inventories and then focuses on a limited number of significant environmental issues.

*Lines indicate substantive changes from previous issue.

B. DISCUSSION

It is important that environmental assessments provide the information needed to estimate and limit potential environmental impacts of nuclear power station construction and operation. If important environmental impacts are identified prior to site preparation and station construction, these impacts can be reduced to acceptable levels by selecting an appropriate site, revising the station design, or modifying operating procedures.

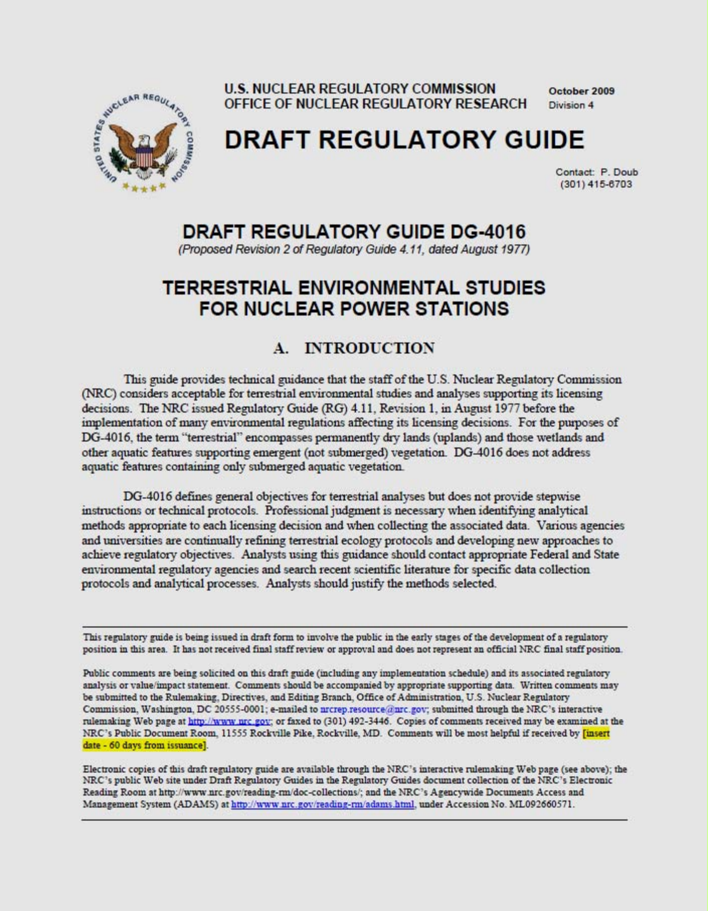
In this guide, environmental studies are divided into five phases: site selection, baseline studies, decommissioning studies, construction monitoring, and operational monitoring. Table 1 shows the organization for terrestrial studies and identifies major tasks and their approximate time schedules.

Adverse impacts on terrestrial organisms or ecological systems have historically resulted from loss or modification of habitat, release of minerals or toxic chemicals into the environment, and direct destruction of biota. A biological effect may be expressed at the level of the individual organisms or through the collective response of organisms at the system level. Examples of effects on individual organisms include death, reduction of health or vitality, accumulation of toxic substances, and alteration of reproductive success. Examples of ecological system effects include changes in birth or death rates; changes of toxic element concentrations throughout entire food webs; and changes in population size, habitat, or community structure.

USNRC REGULATORY GUIDES

December 16, 2009 Presentation

- Requested by ACRS Radiation Protection and Nuclear Materials Subcommittee
- Overview of history of RG 4.11
- Objectives for Revision 2 to RG 4.11
- Detailed summary of Revision 2 (DG 4016)
- Copies of Revision 2 (DG 4016) made available
- Answered questions from Subcommittee
- Received oral comments from Subcommittee



U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

October 2009
Division 4

DRAFT REGULATORY GUIDE

Contact: P. Doub
(301) 415-6703

DRAFT REGULATORY GUIDE DG-4016

(Proposed Revision 2 of Regulatory Guide 4.11, dated August 1977)

TERRESTRIAL ENVIRONMENTAL STUDIES FOR NUCLEAR POWER STATIONS

A. INTRODUCTION

This guide provides technical guidance that the staff of the U.S. Nuclear Regulatory Commission (NRC) considers acceptable for terrestrial environmental studies and analyses supporting its licensing decisions. The NRC issued Regulatory Guide (RG) 4.11, Revision 1, in August 1977 before the implementation of many environmental regulations affecting its licensing decisions. For the purposes of DG-4016, the term "terrestrial" encompasses permanently dry lands (uplands) and those wetlands and other aquatic features supporting emergent (not submerged) vegetation. DG-4016 does not address aquatic features containing only submerged aquatic vegetation.

DG-4016 defines general objectives for terrestrial analyses but does not provide stepwise instructions or technical protocols. Professional judgment is necessary when identifying analytical methods appropriate to each licensing decision and when collecting the associated data. Various agencies and universities are continually refining terrestrial ecology protocols and developing new approaches to achieve regulatory objectives. Analysts using this guidance should contact appropriate Federal and State environmental regulatory agencies and search recent scientific literature for specific data collection protocols and analytical processes. Analysts should justify the methods selected.

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received final staff review or approval and does not represent an official NRC final staff position.

Public comments are being solicited on this draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rulemaking, Directives, and Editing Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; e-mailed to nrcrep.resource@nrc.gov; submitted through the NRC's interactive rulemaking Web page at http://www.nrc.gov; or faxed to (301) 492-3446. Copies of comments received may be examined at the NRC's Public Document Room, 11555 Rockville Pike, Rockville, MD. Comments will be most helpful if received by [insert date - 60 days from issuance].

Electronic copies of this draft regulatory guide are available through the NRC's interactive rulemaking Web page (see above); the NRC's public Web site under Draft Regulatory Guides in the Regulatory Guides document collection of the NRC's Electronic Reading Room at http://www.nrc.gov/reading-rm/doc-collections/; and the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html, under Accession No. ML092660571.

Regulatory Guide 4.11

- Does not **directly** address terrestrial ecology sections in Environmental Reports (ERs) prepared by Industry (included in RG 4.2)

However, RG 4.11 does serve to:

- **Indirectly** improve ERs prepared by Industry by identifying improved terrestrial supporting studies

Yellow-Crown Night Heron
Peyton Doub 2008

Relationship of RG 4.11 to Other NRC Environmental Guidance

Document	Title	Function	Principal User
RG 4.11	Terrestrial Environmental Studies for Nuclear Power Stations	Provide guidance to Industry on the conduct of terrestrial ecology technical surveys and studies	Applicants
RG 4.2	Preparation of Environmental Reports for Nuclear Power Stations	Provide guidance to Industry on preparation of ERs submitted as part of applications	Applicants
NUREG 1555	Standard Review Plans for Environmental Reviews for Nuclear Power Plants	Provide guidance to NRC staff reviewing applications and preparing NEPA documents	NRC Staff

Why Revise RG 4.11

- Changes since 1977 in terrestrial ecology knowledge base
- Changes since 1977 in Federal and state regulatory policy for terrestrial ecology
- Changes since 1977 in terrestrial ecology survey methodologies
- Staff has recognized variability in how COL and ESP applicants have investigated terrestrial ecology
- Need consistent terminology with RG 4.2 and NUREG 1555
- Need to define terrestrial-aquatic boundary
- Need to address wetlands

Reddish Egret
Peyton Doub 2008

Objectives for Rev. 2 to RG 4.11

- Update RG 4.11 to reflect current scientific knowledge and analytical practice.
- Make RG 4.11 consistent with other NRC environmental guidance, including RG 4.2 and NUREG 1555.
- Not outline step-by step procedures, but identify sources of terrestrial ecology data and analytical methodologies.
- Be specific enough to be useful but general enough to avoid need for frequent revision.
- Reflect the need for adequate terrestrial ecology data to support use of RG 4.2 and NUREG 1555.
- Not imply a need for greater effort beyond that currently needed for successful use of RG 4.2 or NUREG 1555.

Part of Proposed Site for CCNPP Unit 3
Peyton Doub 2006

Terrestrial

- Encompasses normally dry lands (uplands)

Plus

- Wetlands supporting emergent (not submerged) vegetation

Planted Pine Forest
Peyton Doub 2008

Tidal Marsh
Peyton Doub 2008

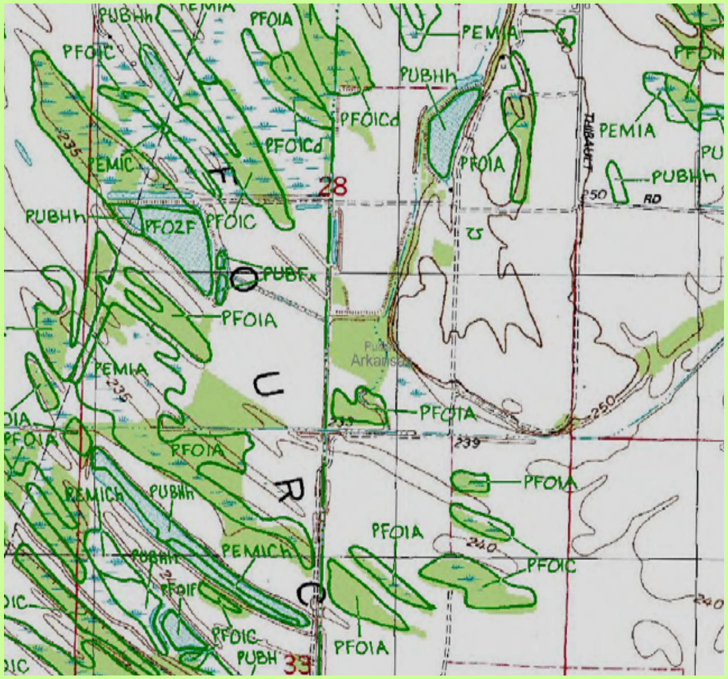
Overall Organization of Rev. 2 to RG 4.11 (DG 4016)

- Siting Support
- Baseline Investigations
- Identifying Important Species and Habitats
- Impact Analyses
- Monitoring
- Decommissioning

Red-winged blackbirds
Peyton Doub 2008

Siting Support

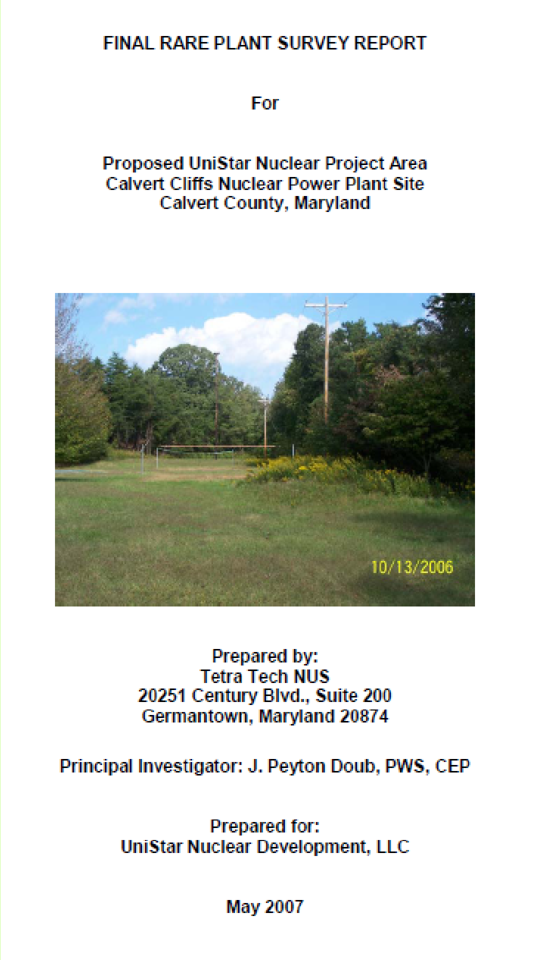
- Addresses terrestrial ecology in evaluating:
  - Site Alternatives
  - Energy Alternatives
  - Heat Dissipation Design Alternatives
- For site alternatives, follows terrestrial ecology considerations in each step of Electric Power Research Institute (EPRI) Report No. 1006878, “Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application,” issued 2002
- Emphasizes use of published data and maps and reconnaissance observations



Portion of National wetland Inventory map
US Fish & Wildlife Service

Baseline Investigations

Investigation	Calvert Cliffs Example
Terrestrial Habitat Identification, Mapping, and Description	Included in Flora Survey Report
Flora Study	Flora Survey Report
Fauna Study	Faunal Survey Report
Wetland Delineation	Wetland Delineation Report
Wetland Functional Assessment	Included in Wetland Delineation Report
Identification of Important Species/Habitats	Rare Plant Survey Report Current Status of Two Federally Threatened Tiger Beetles at Calvert Cliffs Nuclear Power Plant


FINAL RARE PLANT SURVEY REPORT

For

Proposed UniStar Nuclear Project Area
Calvert Cliffs Nuclear Power Plant Site
Calvert County, Maryland

10/13/2006

Prepared by:
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Prepared for:
UniStar Nuclear Development, LLC

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Identifying Important Species

- Defined using specific criteria from NUREG 1555
- Focuses scope of subsequent terrestrial ecological studies
- Focuses scope of applicant's Environmental Report (ER)
- Focuses scope of NRC's Environmental Impact Statement (EIS)
- Assists applicant and NRC with environmental regulatory compliance
- May serve as basis for terrestrial ecological monitoring

American crocodile
Federal Endangered
Peyton Doub 2008

Great White Heron
FL Sp, Special Concern
Peyton Doub 2008

Phragmites australis
Invasive plant species
Peyton Doub 2008

Impact Analyses

- Habitat Loss Analyses
- Wildlife Noise Impact Analyses
- Wildlife Displacement Analyses
- Bird and Bat Collision Analyses
- Avian Electrocution Analyses
- Cooling Tower Drift Analyses

Site Preparation Work for Proposed New Vogtle Reactor
Photo Source: http://www.internal.nrc.gov/news/nrcreporter/2009/slide-show/summer-progress.html

Note: Specific needs for impact analyses are highly project-specific.

Monitoring

- Need for monitoring of terrestrial ecological conditions over construction and operations period can be based on:

  - Conditions in permits under Section 404 of Clean Water Act (U.S. Army Corps of Engineers)
  - Conditions in Biological Opinions under Section 7 of the Endangered Species Act (U.S. Fish & Wildlife Service)
  - Conditions in other Federal and state natural resources permits
  - Mitigation measures in EIS (which licensee commits to implement)
  - NRC license conditions (expected rarely)

- Most terrestrial ecological monitoring requirements will be established and overseen by the U.S. Fish & Wildlife Service and state and local natural resource agencies

Transmission Line Right-of-Way
Peyton Doub 2008

Decommissioning

- Long-term planning
- Restoration of site to functioning terrestrial habitats
- Need for baseline data prior to initial site disturbance
- May require disturbance of naturally vegetated land areas outside of former operational area

Black Vulture
Peyton Doub 2006

Subcommittee Comments

- Be sure Revision 2 calls out RG 4.2 (on Environmental Report preparation)
- Specificity in Revision 2 is desirable – It should be roadmap for applicants to minimize potential for RAIs
- Include a discussion of how products produced following RG 4.11 will be used by NRC to comply with NEPA
- Clearly state that RG 4.11 is specific to nuclear power station licensing and does not apply to other NRC licensing such as for fuel cycle activities
- Be careful in use of words such as “may”, “can”, “recommend”, and “encourage”.

Future Direction

- Incorporate Subcommittee comments from December 16, 2009.
- Incorporate comments received from today's presentation.
- We are still waiting for internal review and possible comments from NRR.
- Issue proposed Revision 2 to RG 4.11 (as DG 4016) for public comment.
- Revise DG 4016 to incorporate public comments.
- Publish Revision 2 to RG 4.11.
- Encourage future applicants to use Revision 2 to RG 4.11.
- Evaluate how well Revision 2 to RG 4.11 improves terrestrial ecological data included in future application packages.
- Consider development of companion RG addressing aquatic ecological studies.

Bald Eagles mating
Peyton Doub 2008

Status of Rulemaking for Depleted Uranium and Other Unique Waste Streams

Presented to Advisory Committee on Reactor Safety
570th Meeting, March 4-6, 2010

Patrice Bubar, Deputy Director
Division of Waste Management and Environmental Protection

Overview

- Background
- Commission Direction
- Rulemaking
- Summary of Workshops
- Next Steps

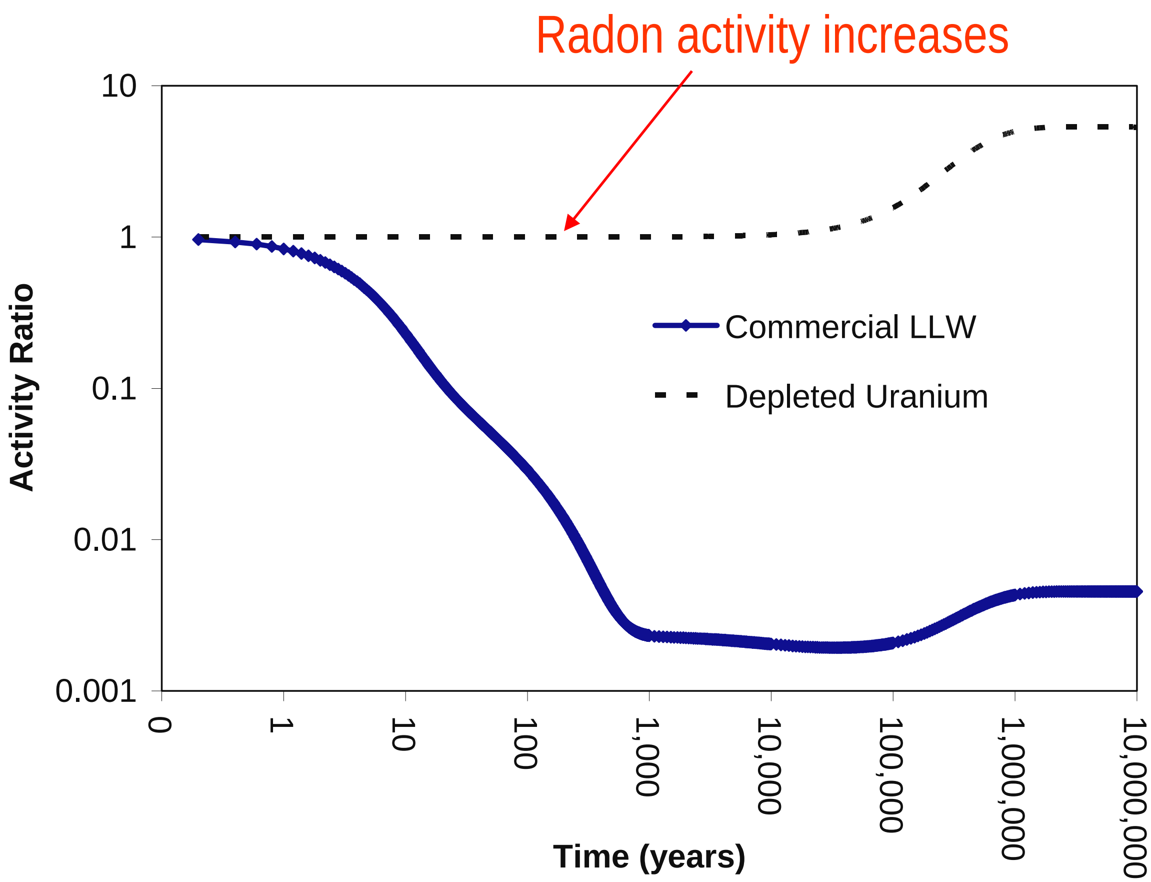
Background

- Depleted Uranium (DU):
  - Limited consideration in 10 CFR Part 61
  - Concentrations and quantities generated today exceed earlier Part 61 considerations
  - "Unique waste stream"
  - Concerns:
    - Behavior over time
    - Mitigation possible

Increase burial depth

Install robust radon barrier

DU vs. Typical LLW



Commission Direction

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- Memorandum and Order CLI-05-20 (dated 10.19.05)
  - Commission directed staff, “outside of the LES adjudication, to consider whether the quantities of depleted uranium (DU) at issue in the waste stream from uranium enrichment facilities warrant amending section 61.55 (a)(6) or the section 61.55 (a) waste classification tables.”

SECY-08-0147

- Prepared in response to Commission Order CLI-05-20

- Content
  - Technical analysis evaluating impacts of near-surface DU disposal
  - Provided four possible regulatory approaches
  - Identified preferred option

Staff Analysis

- Screening model for unique waste streams developed for SECY-08-0147
- Analysis methodology consistent with original Part 61 analysis
- Examined key variables:
  - Period of performance
  - Disposal depth
  - Receptor types and scenarios
  - Site characteristics
- Performed probabilistic assessment

Results

- If radon gas is included, shallow disposal at an arid site is challenging
- For humid sites, the groundwater pathway can exceed the performance objectives
- Greater consideration of long-term stability needed
- Site-specific conditions can result in large variance in dose impacts

Options Evaluated

- Generic Communication
- Require site-specific analysis
- Classification of DU within existing Part 61 framework
- Re-examine existing Part 61 waste classification framework

SRM-SECY-08-0147

- In SRM dated 3.18.09, Commission approved Staff Option #2
  - Amend Part 61 to require site-specific performance assessment for DU disposal
  - Develop PA guidance document and obtain public input
- In the longer-term, Commission also directed staff to budget to re-examine Part 61 waste classification framework
  - Updated waste stream assumptions concerning LLW
  - Conformance with ICRP methodologies

Public Workshops

- Promptly conduct public workshop to discuss:
  - Issues associated with DU disposal
  - Potential issues to be considered in rulemaking
  - Technical parameters of concern in the PA
- Two Workshops Completed
  - September 2-3, 2009, Bethesda, MD
  - September 23-24, 2009, Salt Lake City, UT
  - Attendance exceeded 160 participants

Public Comments

- Rule should …
  - Specify time period of regulatory concern (period of performance)
  - Requirement to perform and update PA
  - Specify intruder dose limit of 500 mrem/yr
- Guidance should …
  - Specific details about exposure scenarios
- No need to define threshold for “significant quantities”

Comments (con't.)

- No need to define the term "unique waste streams"
  - Address on a case-by-case basis through PA
  - Do not "overreach" during the initial rulemaking

Guiding Principles

- Risk-Informed/Performance-Based Regulation
  - 1995 PRA *Policy Statement*
  - Direction-Setting Initiative 12 (COMSECY-96-061)

PA Rulemaking Time Table

- Public workshops
  - *September 2009*
- Technical/regulatory basis document
  - *September 30, 2010*
- Proposed rule and draft guidance
  - *September 30, 2011*
- Final rule and guidance
  - *September 30, 2012*

Long-Term Rulemaking

- Risk-inform Part 61 waste classification framework
- Change conforming legislation as needed
- Evaluate and revise waste classification tables
  - Explicitly address classification of DU
  - Consider full range of alternatives

Public Concerns

- Shallow land burial may not be appropriate
  - Deep geologic disposal may be more appropriate
  - Disposal in salt domes may be more appropriate
- Public release of the SECY-08-0147 screening model and regulatory basis document
- Compatibility assignment and implementation

Next Steps …

- Development of PA guidance for interim use
- Offer to demonstrate/explain SECY-08-0147 model to public
- Respond to any requests for technical assistance to States
  – Increased communication with stakeholders and public on LLW management issues

Next Steps (con’t.)

- Incorporate public comments into development of technical/regulatory basis document
- Issue key messages from September 2009 workshops on website

LLW/DU Resources

- Visit the NRC unique waste stream website at …

  http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html

- Commission's 1995 PRA *Policy Statement*

  http://www.nrc.gov/reading-rm/doc-collections/commission/policy/60fr42622.pdf